OBE-The Estimation of a Justified Correlation between the Mission and Program Educational Objectives Statements for an Engineering Program taking Graduate Attribute Attainment as Basis

Sumanth P Desai[1]

[1]Faculty of Mechanical Engineering, KLE Dr. MSS College of Engineering and Technology, Belgaum

---***---

Abstract - *The accreditation criteria for the current engineering program requires to justify the extent of correlation between the Mission and Program Educational Objectives (PEO) statements, this is in accordance with the new draft of the Self-Assessment Report specified by the National Board of Accreditation, India[1]. This paper exhibits an effective process to achieve the extent of correlation between the Mission and PEO statements by mapping them with the graduate attributes (GA) [2] the same is articulated by the stake holders of the program while framing the Mission and PEO statements. The paper also aims to highlight a relation that is developed to justify the above said correlation between the mission and PEO statements by taking GA attainment as basis, which is obtained by analysis of the feedback from the alumni of the program.*

Key words: Mission, Program Educational Objectives (PEO), Graduate attributes (GA) and Stake holders.

1. INTRODUCTION

Formation of the Vision, Mission and PEO is an iterative process which involves all the stakeholders of the program. The primitive phases include formation of the progressive Vision, Mission and PEO statements keeping the GA as basis. Further the program coordinator (Facilitator for framing the vision, mission and PEO statements) conducts the brainstorming sessions taking the stakeholders of the program and arrives at the finalized statements, from whom Program Outcomes (PO)are also framed and further the course coordinators frame the respective Course Outcomes (CO) for their courses. The stakeholders also map the framed Mission and PEO to the GA which is shown in table 1. Once the key constituents (Vision, Mission, PEO, PO and CO) are framed, their attainment needs to be assessed which will close the loop and gives a feedback for further improvement. Sateesh Narasivayam et al [3] reports a continual improvement loop where the course outcomes attainment is mapped to PO, the PO attainment will lead to PEO attainment, in turn to vision and mission and further to the GA which is the focus or goal of the entire accreditation process. M.S. Jaafar et al[4] report a strategy by mapping the CO and PO and further assessing the attainment of PO with the attainment of CO. The attainment of CO forms the bases and can be assessed both

by direct and indirect assessment. Hamimi Fadziati Awahab et al [5] uses a direct assessment method to assess the PO attainment through direct assessment of the course outcomes as an step up to the previous put into practice where the CO was assessed indirectly by means of surveys and exam results and reports it as a more precise technique to assess the CO attainment. Therefore its very imperative that directs assessment process is a better way to assess CO and PO.
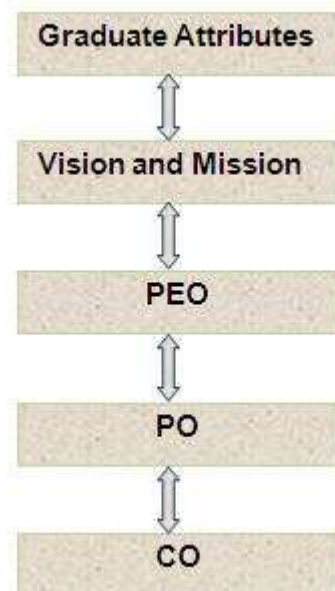

Figure 1: Formation of the key constituents and their attainment

It is difficult however to assess the attainment of PEO by direct assessment since they need to be assessed in a longer run of 3-5 years after their formation, which unlike CO and PO are less real-time. Therefore indirect assessment is still a preferred means to assess PEO, Mission and GA. Thus it becomes very reasonable to know the assessment methods used to gauge the attainment levels of the key constituents as it plays a pivotal role in developing a justified correlation. Since the Mission and PEO are framed directly from the GA a relation can be developed between them.

2. Methodology

The mapping of the Mission and PEO with the GA as given by the stake holders of the program is shown in the Table1. Mapping may vary based on perceptions of a person and is taken here solely for understanding the concept, two mission statements and two PEO are taken as examples to map against the GA.

Graduate Attributes [2]
 1. Engineering Knowledge
 2. Problem Analysis
 3. Design/development of solutions
 4. Conduct investigations of complex problems
 5. Modern tool usage
 6. The Engineer and society
 7. Environment and sustainability
 8. Ethics
 9. Individual and Team work
 10. Communication
 11. Project management and finance
 12. Life-long Learning

Mission 1: To outshine in academics
Mission 2: To inspire the faculty and student fraternity for career development
PEO 1: Graduates of the program will have successful technical or professional careers
PEO 2: Graduates of the program will continue to learn and to adapt in a world of constantly evolving technology

Table 1Mapping of the Mission and PEO with the GA

Graduate Attributes	1	2	3	4	5	6	7	8	9	10	11	12
Mission1	✓	✓	✓	✓	✓	✓			✓	✓		✓
Mission2	✓	✓	✓	✓	✓	✓	✓		✓			✓
PEO1	✓	✓	✓	✓	✓	✓	✓		✓			✓
PEO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓

We can generate a correlation between the PEO and Mission from the above tables taking GA, since it is common.

Let us consider *PEO1* and *Mission1*

PEO1 maps with **GA-*1, 2, 3, 4, 5, 6, 9*, 10** and *12*

Total count =9

Mission 1map with **GA-*1, 2, 3, 4, 5, 6*, 9** and *12*

Total count =8

$$Correlation = \frac{Common\ attributes\ mapped\ to\ respective\ PEO\ and\ Mission}{Maximum\ of\ the\ total\ count\ of\ attributes\ mapping\ with\ PEO/Mission}$$
---- [1]

Correlation between PEO1 and Mission 1: $8/9 = 0.88 \cong 0.9$

Since all the values lie in range of 0 to 1 a range is determined for different correlation levels as shown in Table 2.

Table 2 Range of values and their respective correlation level

Range	Correlation level
0.00 - 0.33	**1 (Low)**
0.34-0.67	**2 (Medium)**
0.68-1.00	**3 (High)**

Similarly correlation levels can be established between all the PEO and Mission statements as shown in table 3

Table 3 Correlation levels between PEO and Mission statements

	Mission1	Mission2
PEO1	3	3
PEO2	3	3

It is very obvious that a reasonably higher correlation among the PEO and Mission requires for a higher attainment of GA and vice versa as they are derived from the GA. Since Alumni are the direct beneficiary of the program, a survey/feedback from them in regard to the attainment of GA is more meaningful. The GA are assessed in a score based on likert scale (1-5) with score 5 signifying a high GA attainment the same is depicted in Table 4. The GA attainment will also encompass the attainment of the Mission and the PEO. Figure 2 depicts the process to arrive at the justified correlation by taking the GA attainment into consideration in order to reflect the efficacy of the correlation in the attainment process.
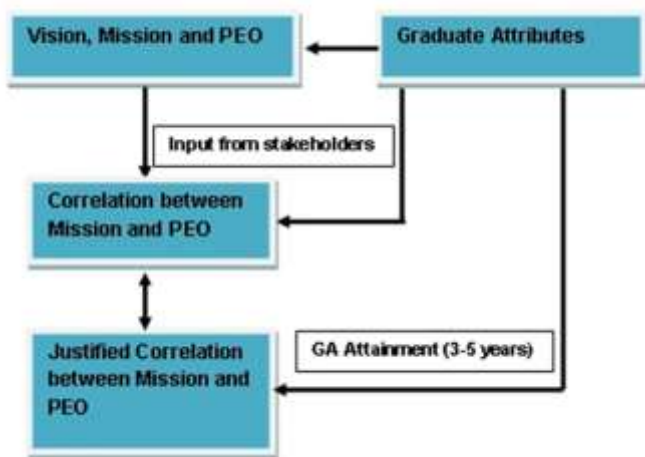
Figure 2: The process to arrive at the justified correlation

Table 4 The GA[2] attainment from the Alumni survey

Sl. no	Graduate Attributes	5	4	3	2	1
1	Engineering Knowledge					
2	Problem Analysis					
3	Design/development of solutions					
4	Conduct investigations of complex problems					
5	Modern tool usage					
6	The Engineer and society					
7	Environment and sustainability					
8	Ethics					
9	Individual and Team work					
10	Communication					
11	Project management and finance					
12	Life-long Learning					

In order to emphasize the importance of GA attainment towards the correlation, two cases of GA attainment have been taken as an example for a sample size.

Case1 depicts a higher GA attainment which is shown in table 5.

Table 5 Higher GA attainment score (Score above 4)

GA	1	2	3	4	5	6	7	8	9	10	11	12
Score	4	4.5	5	4.5	4.4	4.8	4.8	4	4.6	4.4	4.8	4.8

Case2 depicts a lower GA attainment which is shown in table 6

Table 6 Lower GA attainment score (Score below 3)

GA	1	2	3	4	5	6	7	8	9	10	11	12
Score	2	2.5	3	2	2.5	2.5	3	2.1	1.5	1.8	2	2.3

3. Results and discussion

The correlation can be justified by taking the weights of GA from the alumni survey; considering the weighted average of the GA attainment from table 5 and 6 respectively. The justified correlation between the Mission and PEO can be expressed as

$$\text{Justified Corelation} = \frac{\frac{\text{Count of common attributes in respective PEO and Mission}}{\text{Maximum of the total count of attributes in the respective PEO or Mission}} * \text{sum of weight of common attributes}}{\text{Maximum total weight of all the attributes}}$$

---- [2]

Assume case1 having a higher GA attainment for PEO1 and Mission1

Therefore, Sum of weight of common attributes = 4+4.5+5+4.5+4.4+4.8+4.6+4.8
    (For GA *1, 2, 3, 4, 5, 6*, *9 and 12* from table 5)
=36.6

$$\textit{Justified Correlation} = \frac{\frac{8}{9} * 36.6}{60} = .542$$

The justified correlation between PEO1 and Mission 1 is level **2** (Medium)

Similarly justified correlation between all the PEO and Mission statements are established.

Table 7 Justified correlations between PEO and Mission in High GA attainment

Case1	Mission1	Mission2
PEO1	2	3
PEO2	2	2

Let us now assume case 2 wherein there is a Lower GA attainment for PEO1 and Mission1.

Therefore, Sum of weight of common attributes = 2+2.5+3+2+2.5+2.5+1.5+2.3
    (For GA *1, 2, 3, 4, 5, 6*, *9 and 12* from table 6)
= 18.3

$$\textit{Justified Correlation} = \frac{\frac{8}{9} * 18.3}{60} = 0.271$$

The justified correlation level between PEO1 and Mission 1 is Level1 (Low).

Similarly justified correlation between all the PEO and Mission statements are established.

Table 8 Justified correlations between PEO and Mission in low GA attainment

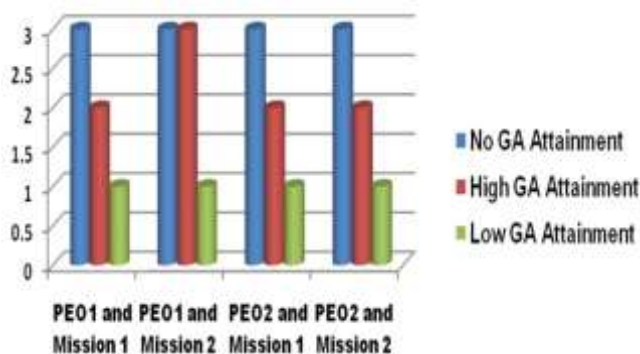| *Case2*	Mission1	Mission2
PEO1	1	1
PEO2	1	1

Figure 3 Consolidated correlation levels between PEO and Mission

Figure 3 shows the impact of the GA attainment in generating the justified correlation where a high GA attainment showed a progressive high correlation and a low GA attainment showed a progressive low correlation in comparison to the set correlation standards as per the inputs given by the stakeholders of the program. The example shows that the set correlation between PEO1 and Mission 1, which is **level3,** initially and reduced to *level 2* for a high GA attainment and *level 1* for a low GA attainment. The interpretation follows for the other Mission and PEO correlations. The correlation can now be reframed to correct level of correlation by taking equation 2.

4. Conclusion

The paper focuses on a process to arrive at a justified correlation between the Mission and PEO statements, wherein an initial correlation is generated by mapping with the GA the same articulated by the Stakeholders of the program. Further the correlation is verified or justified by taking the GA attainment from the alumni and a relation is developed considering the weights of GA attainment and it is evident that the GA attainment impacts the correlation with a high GA attainment in favor and a lower GA attainment against the predefined correlation. The results showed dramatic decrease in the

correlation for a lower GA attainment, the inferences that can be derived are either the PEO and Mission are under/over mapped or teaching learning process is not efficient and either of them needs to be addressed. In order to have a higher correlation the Mission and PEO statements should be broad, inline together and encompass as many GA as possible and the teaching learning process must be robust and help in attaining the key constituents to the greatest extent.

References

1) NBA website archives. Available:http://www.nbaind.org/Files/UG_Tier %20II%20-%20SAR.pdf

2) International Engineering alliance website. Available:http://www.ieagreements.org/IEA-Grad-Attr- Prof-Competencies.pdf

3) SateshNamasivayam et al "A blueprint for executing continual quality improvement in an engineering undergraduate programme" Journal of Engineering Science and Technology Special Issue on Engineering Education, page no 34, April 2013.

4) M.S. Jaafar, et al, "Assessment Strategy for an Outcome Based Education", International Conference on Engineering Education 2008 (ICEE 2008), Budapest Hungary. Internet address http://icee2008hungary.net/download/ fullp/full-papers/full-paper46.pdf