



DEVELOPMENT OF PROGRAM EDUCATIONAL OBJECTIVES (PEO) FOR ENGINEERING PROGRAM AT UNITEN

Adzly Anuar[†]

Centre of Engineering Education, College of Engineering, Universiti Tenaga Nasional, Malaysia

Hazlinda Hakimie

Centre of Engineering Education, College of Engineering, Universiti Tenaga Nasional, Malaysia

Miszaina Osman

Centre of Engineering Education, College of Engineering, Universiti Tenaga Nasional, Malaysia

Khairul Salleh Mohamed Saharia

Centre of Engineering Education, College of Engineering, Universiti Tenaga Nasional, Malaysia

ABSTRACT

The College of Engineering (COE) of Universiti Tenaga Nasional (UNITEN), Malaysia has implemented outcome-based education (OBE) in all its engineering programs since 2007 due to the requirement of accreditation body, the Malaysia Engineering Accreditation Council (EAC). Recently EAC has introduced new updates and consequently, COE has developed a new set of PEO (Program Educational Objectives) and PO (Program Outcomes) to fulfil this requirement. A new approach is used in coming up with these objectives and outcomes. This paper describes the process of developing the PEO and PO at college level and how stakeholders' inputs are being taken into consideration in improving the outcomes. This paper also discusses on how these outcomes are trickled down and implemented at department level.

© 2014 AESS Publications. All Rights Reserved.

Keywords: Outcome-based education, Program objectives, Engineering program, Accreditation, Program outcomes, Stakeholder.

1. INTRODUCTION

One of the main requirements to acquire accreditation from the Engineering Accreditation Council (EAC) of Malaysia for any engineering program is the implementation of Outcome-Based Education (OBE). One of the first elements that are required to be developed in the implementation of OBE is the Program Educational Objectives (PEO). As defined in EAC manual 2012, PEOs are

[†] Corresponding author

ISSN(e): 2224-4441/ISSN(p): 2226-5139

© 2014 AESS Publications. All Rights Reserved.

a set of goals or target that describes the expected achievement of the graduates in the career a few years after graduation (EAC (Engineering Accreditation Council), 2012). These goals must be consistent with the vision and mission of the academic institution, and take into consideration the need of relevant stakeholder to the program.

At College of Engineering (COE), all engineering programs have implemented OBE since 2007. With the changes in the recent EAC manual 2012, it was decided to review the present PEO statement and target. Outcomes from PEO attainment from previous years were evaluated and the feedback from stakeholder was taken into consideration in developing the new PEO.

2. DEVELOPING PEO AND ASSESSMENT

The development of a degree program and in this case, OBE implementation usually starts with the development of PEOs. This is when the college or faculty envisage what graduates should achieve in their career life years after graduation from UNITEN. There are several approaches proposed in developing the PEOs (Younis, 2003; Al-Attar *et al.*, 2010; Ahmad Basri *et al.*, 2011; Weisbrook and Schonberg, 2011). Common elements would include the acquirement of stakeholder inputs, forming a team to evaluate the requirement and formulating the statements and targets. For PEO assessment, the most common method is through survey (Estell and Williams, 2011; Makinda *et al.*, 2011).

At College of Engineering (COE) the general flow of OBE implementation has been established since 2011. Minor improvement has been made recently to differentiate between of the review cycle and data collection cycle, as shown in Figure 1. Developing of PEO statement is part of PEO planning, the outer-most cycle in OBE implementation. Usually the College Teaching and Learning Committee (CTLTC) will carry out PEO review every 3 to 5 years, or whenever special needs arise. CTLTC consists of Head of Departments and representatives from all departments in the college. Data collection is conducted annually which mainly consists of acquiring alumni and industry feedback on alumni achievement through a survey.

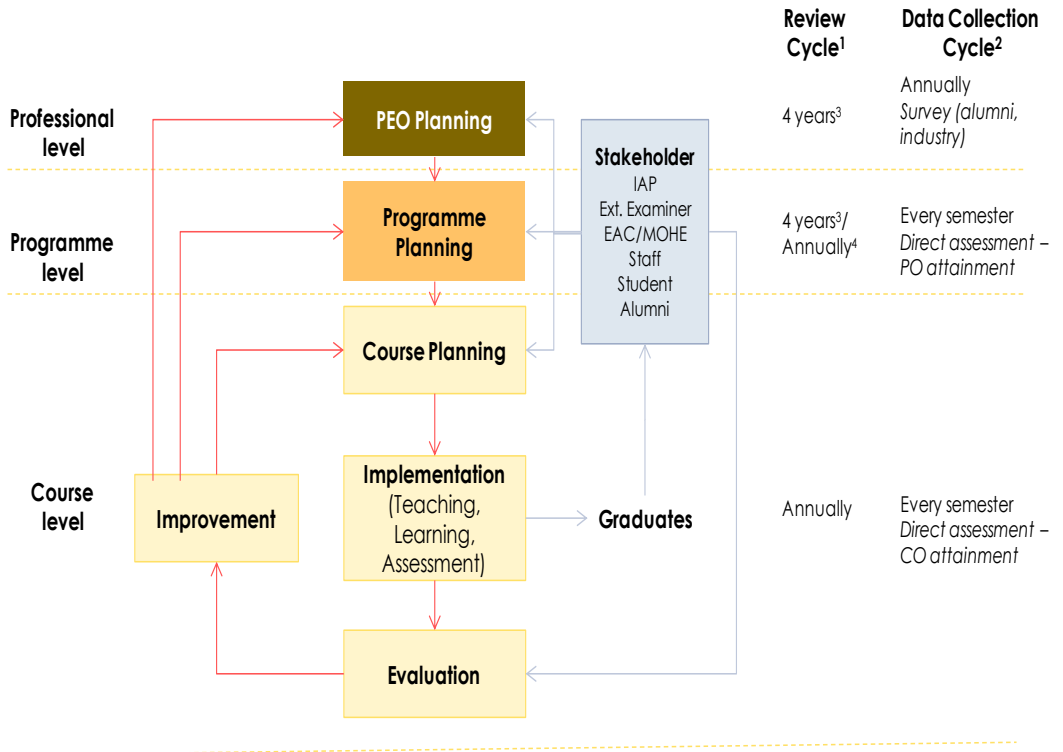
2.1. Reviewing Existing PEO

For establishing new PEOs, the process starts with acquiring inputs for the formulation of the draft of the PEOs. It will be fine-tuned based on stakeholders' feedback. Implementation of the new PEOs will only happen upon approval from the university's senate.

Since all programs in COE have already implemented OBE, the process starts by reviewing the existing PEOs, identifying the gap with the new EAC requirement and also the university's new vision and mission. The flow of this process is as shown in Figure 2. All programs under COE have similar PEO statements.

The PEO achievement review is carried out every 1 to 2 years through alumni survey. The department will evaluate the results and come up with action plans for continual quality improvement of the programs.

Figure-1. Overall OBE implementation strategy



Note:

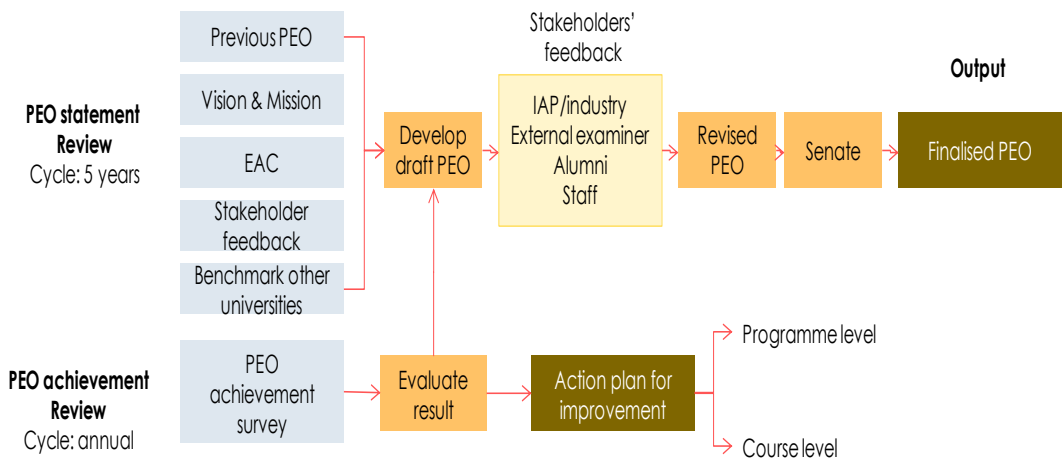
¹ Standard duration for review, unless special needs arise.

² Data is collected according to the periodic cycle, and compiled to be used for review.

³ PEO & PO statements/target review

⁴ Programme level review on attainment results & improvement

Figure-2. Process for developing and reviewing PEO



The current PEO statements targeted for Bachelor of Mechanical Engineering (BME) are shown in Table 1. PEO statements for Bachelor of Electrical and Electronics Engineering (BEEE), Bachelor of Electrical Power Engineering (BEPE), Bachelor of Computer and Communication Engineering (BCCE) and Bachelor of Civil Engineering (BCE) are very similar to that of BME in that the difference lies only on the field specific term; for example the term ‘mechanical’ is replaced with ‘civil’ for BCE.

Table 2 shows the new and previous vision and mission of UNITEN. It can be seen that the current PEOs do not strongly support the direction of the new vision. Thus, the lack of support needs to be addressed in the new PEO statements.

Table-1. Current PEO statements for BME

Program Objectives		
	The department shall produce ME graduates who, after 5 years of graduation,	Performance criteria
PEO1	Are practicing engineers in mechanical engineering with the ability to venture into other related fields.	80% mechanical engineers
PEO2	Hold senior engineering positions.	30% senior engineers 1% of self-entrepreneur in engineering or related areas
PEO3	Have professional qualifications/certifications in mechanical engineering related areas.	10% professional engineers 60% registered in professional bodies
PEO4	Are actively engaged in mechanical engineering activities, in specialized areas such as energy and production.	60% work in specialized areas

Table-2. Vision and mission of UNITEN

	New	Previous
Vision	A leading global energy university that shapes a sustainable future	To be a premier University in Engineering, Information Technology and Business
Mission	We strive to advance knowledge and learning experience through research and innovation that will best serve human society	We are committed to deliver a unique and enriching learning experience that fosters innovation and research

In order to gauge the PEO achievement, alumni survey is conducted. Even though the response was relatively low, the result can still be used as an indicator for overall achievement of the program. The result of the survey is shown in Table 3. From the survey, the target for PEO1 and PEO4 were achieved. However, for PEO2, the percentage of senior engineer is below target. The target for PEO3 was also not achieved. It is believed that the reason the achievement of PEO2 and PEO3 are below average may be because the survey questions did not capture the data required.

Table-3. Alumni survey result of PEO attainment (BME)

PEO	Performance criteria/Target	Latest survey result (no. of respondent = 65)	Comment
PEO1	80% mechanical engineers	89.23% of the respondent work in mechanical or engineering related field	The result is above target.
PEO2	30% senior engineers 1% of self-entrepreneur in engineering or related areas	23% are in senior engineer or managerial positions. 4.6% are self-entrepreneur	The result for senior engineer is also less than the target but the percentage of self-entrepreneur is above target
PEO3	10% professional engineers 60% registered in professional bodies	27.7% are registered with professional bodies	The result is below target.
PEO4	60% work in specialized areas	78% are working in specialized areas	The result is above target.

2.2. Stakeholder Input

Input from the Industry Advisory Panel (IAP) and External Examiner were also acquired. The summary is as shown in Table 4. These suggestions are to be taken into consideration when developing the new PEO.

Table-4. Summary of feedback from IAP and External Examiner

Stakeholder	Input and feedback
IAP	The panel discussed the current PEO in detailed. It was commented that the current PEO can be maintained and all targets are logical except for PEO 4. The mechanism to capture the attainment of PEO and also the target must be properly set since it is a bit subjective.
External examiner	The external examiner has suggested that the first PEO to be modified to incorporate the term ‘energy’ in place of others, in view of the new vision and mission of UNITEN. It is also suggested that the last PEO is replaced with “Engages in activities to enhance knowledge in their professional works” in view of the importance of life-long learning in OBE approach.

2.3. Developing New PEOs

Based on the stakeholders’ input and the attainment results from stakeholder survey, PEO statements and targets were revised. Minor rewordings were made for PEO1, PEO2 and PEO3, while PEO4 has been changed to a totally new objective which is “Engages in activities to enhance knowledge in their professional works”. This is to reflect the importance of life-long learning for our graduates. Table 5 shows the draft statements and attainment criteria for the new PEOs.

In tandem with the development of the new PEOs, a survey was produced as a means of obtaining feedback from alumni and industries on the relevance and importance of the new PEO statements. Respondents rated the new PEO statements using the 5-point Likert-type scale, ranging from 1 (not important), 3 (neutral), and 5 (very important).

Table-5. New PEO statements (BME)

PEO	Statement	Attainment criteria	Target
PEO 1	Practicing engineers in mechanical engineering with the ability to venture into energy related business.	Percentage of alumni working as mechanical engineers	80% mechanical engineers 40% in energy related field or business
PEO 2	Hold leadership responsibilities and/or establish their own enterprises.	Percentage of alumni holding leadership responsibilities Percentage of alumni becoming an entrepreneur	30% holding leadership responsibility 1% entrepreneur
PEO 3	Have professional qualifications/certifications in mechanical engineering related areas.	Percentage of alumni registered as professional engineer (holding Ir or CEng title) Percentage of alumni registered in professional bodies (eg IET, IEM, IEEE etc)	5% professional engineers 40% registered in professional bodies
PEO 4	Engages in activities to enhance knowledge in their professional works	Percentage of alumni engage in lifelong learning activities	60% engaging in lifelong learning activities

Figure 3 shows the graph of response from alumni survey. For PEO1, 90% of the respondent indicates that it is either important or very important. For PEO2, PEO3 and PEO4, the results obtained were 93%, 80% and 91%, respectively, indicating that they are either important or very important. From these results, it can be seen that most of the alumni are favourable with the new PEO statements.

Figure 4 shows the graph of response from industry survey. The results obtained were 78%, 86%, 60%, and 90% for PEO1, PEO2, PEO3 and PEO4 respectively.

Figure-3. Graph showing response from alumni survey

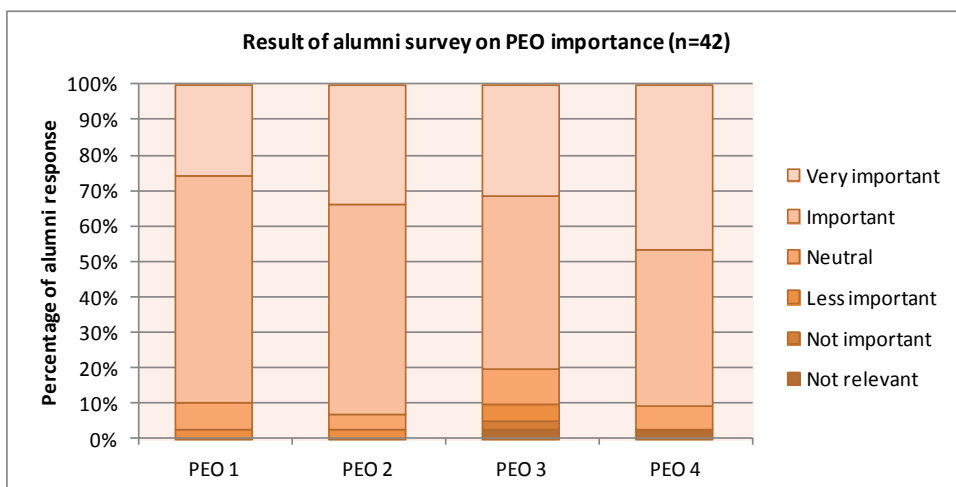
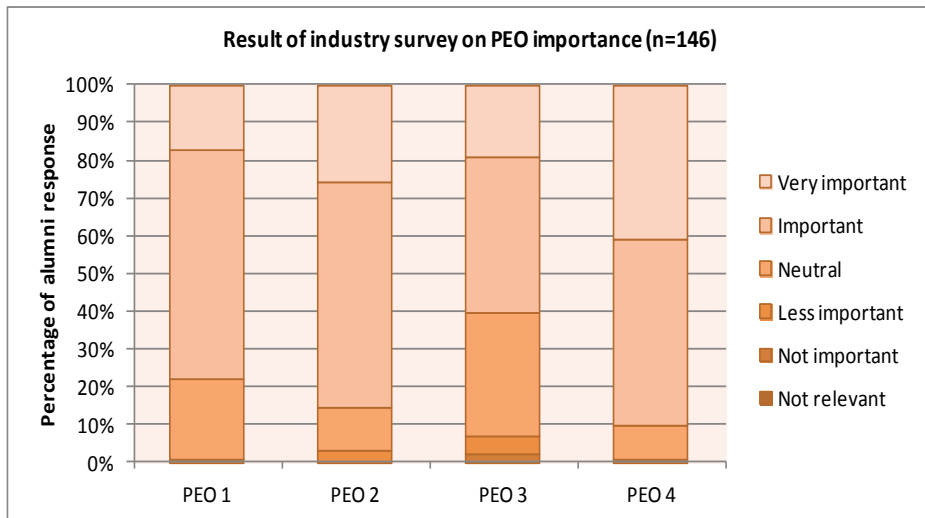


Figure-4. Graph showing response from industry survey



Target for each PEO is also revised as shown in Table 5. For PEO1, an additional target of “% of alumni working in energy field or business” has been added, consistent with the vision of becoming a leading global energy university. The target for PEO3 has been changed to 5% instead of 10% following the recommendation from stakeholder and also based on the previous PEO achievement result.

3. CONCLUSION

This paper describes the process of reviewing the PEO statements and target for engineering programs under COE at UNITEN. This review was conducted in line with the new vision and missions of the university and also the new manual from governing body, in this case the Engineering Accreditation Council (EAC). Input and feedback from stakeholder were taken into consideration when drafting the new PEOs. After the new PEO was developed, it is then sent to alumni and industry to rate their importance. Based on this survey, the majority of the respondent indicates that the PEOs are either important or very important.

The college has carried out an extensive process in reviewing the PEOs to ensure that they reflect the requirements of stakeholder. The new PEO is submitted to senate for approval and to be implemented in academic year of 2013/14.

4. ACKNOWLEDGEMENTS

The authors would like to thank all that involved in the review process.

REFERENCES

- Ahmad Basri, N., K. Abu Taib, O. Jaafar, S. Md Zain, F. Suja, A. Kasa, S. Osman and N.E. Shanmugam, 2011. An evaluation of programme educational objectives and programme outcomes for civil engineering programmes original research article. *Procedia – Social and Behavioral Sciences*, 18: 56-64.

- Al-Attar, H., B. Abu-Jdayil and M. Al-Marzouqi, 2010. Assessment of educational objectives in chemical and petroleum engineering programs. 3rd International Symposium for Engineering Education, University College Cork, Ireland.
- EAC (Engineering Accreditation Council), 2012. EAC manual 2012. Board of Engineers, Malaysia.
- Estell, J. and S. Williams, 2011. Program educational objectives: What constitutes sufficient assessment? American Society of Engineering Education, Paper AC2011-22.
- Makinda, J., N. Bolong, L. Gungat and A. Sarman, 2011. Assessment of program educational objectives using Alumni survey: The UMS experience. Proceeding of 3rd International Congress on Engineering Education (ICEED). pp: 14-17.
- Weisbrook, C. and W. Schonberg, 2011. A streamlined approach to developing and assessing program educational objectives and program outcomes. American Society of Engineering Education, Paper AC2011-1179.
- Younis, N., 2003. Establishing and assessing educational objectives for engineering programs. Proceedings of 2003 American Society for Engineering Education Annual Conference & Exposition, Session 1360.

Views and opinions expressed in this article are the views and opinions of the authors, International Journal of Asian Social Science shall not be responsible or answerable for any loss, damage or liability etc. caused in relation to/arising out of the use of the content.