

Analysis of Graduates Performance Based on Programme Educational Objective Assessment for an Electrical Engineering Degree

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Abstract: Programme Educational Objectives (PEOs) are specific goals that are aligned with the vision and mission of an institution of higher learning. The PEOs describe the expected achievements of the graduates in their career and professional accomplishment after graduation. At Faculty of Electrical Engineering, Universiti Teknologi MARA, Shah Alam, the PEOs of undergraduate programmes are particularly designed to ensure that the graduates are well-equipped with a broad foundation of theoretical and practical knowledge in various electrical engineering areas of interest and to prepare them for the rapidly changing engineering technology. These PEOs are carefully aligned with the vision and mission of the university and faculty and should be achieved by the graduates 3 to 4 years after graduating. These PEOs must be assessed and evaluated to determine the PEOs' attainment of the programme. Therefore, assessment and evaluation activities must be available to plan and organize the process of obtaining the PEOs' attainment. Surveys on graduate attributes need to be conducted to gain feedbacks from stakeholders 3 to 4 years after graduation. In this study, anonymous online questionnaire survey was created to obtain the feedbacks from the alumni. These feedbacks are then analysed to assess the PEOs' attainment. In order to evaluate the performance of the PEOs, performance indicators are developed and used in the evaluation. Outcomes from this study are used to determine the achievement of PEOs and to propose the improvement as part of continuous quality improvement (CQI).

Keywords: Alumni survey, PEOs' assessment, PEOs' attainment', PEOs evaluation,

1. Introduction

Malaysian Qualifications Agency Act was launched in 2007 with the establishment of Malaysian Qualifications Agency (MQA). The main responsibility of MQA is to monitor and oversee the quality assurance practices and accreditation of national higher education in Malaysia. The basis for quality assurance of higher education is based on Malaysian Qualifications Framework (MQF), which also used as the reference point for the criteria and standards for national qualifications.

Subsequently, the Board of Engineers Malaysia (BEM) introduced a new accreditation manual based on the Outcome Based Education (OBE) in 2007. Since 2007, all the 4-year engineering degree

programmes in Malaysia have been accredited under the OBE approach which put a very strong emphasis on the programme educational objectives and programme outcomes assessment and evaluation (Abdul Wahab Mohammada & Azami Zaharima, 2012).

Assessments in OBE includes the assessment of the Course Outcomes (CO), which are assessed at the end of the course; the Program Outcomes (PO), which are assessed upon graduation and the Program Educational Objectives (PEO), which are assessed after three to five years of their graduation date. Nur Irfah Mohd Pauzi et al., 2010 in their study stressed that to close the loop, three levels need to be completed, i.e. at the Course level, Programme level and Programme Educational Objective (PEO) level. K.Y. Tshai, et al., 2014 concluded that determining students' satisfaction level in their attainment of PEO is an essential part in closing the loop (CDL) of the continual quality improvement (CQI) process within the context of OBE.

The PEOs are defined as specific goals consistent with the mission and vision of the institution of higher learning, and are responsive to the expressed interest of programme stakeholders describing expected achievements of graduates in their career and professional life after graduation (Jodin Makind et al., 2011). Wan Hamidon Wan Badaruzzaman (2015) in one of his EAC Training Modules, outlined the criteria of good PEOs which includes distinctive, specific, measurable, achievable, result oriented, and having a time frame. The “employability skills” or the generic abilities of the graduates that encompassing personal aspects and the ability to work in groups can be evaluated as the part of their achievement (Nabilah Abdullah et al., 2012).

At the Faculty of Electrical Engineering (FKE) in Universiti Teknologi MARA (UiTM), Shah Alam, all the undergraduate programmes are designed based on OBE requirements starting December 2008. The first cohort of the students were graduated in May 2012.

The description and performance indicators of the PEOs are used to formulate an anonymous online questionnaire survey to measure the PEOs' attainment. Key outcomes from this study will be analysed to determine the achievement of PEOs and to propose the improvement as part of CQI.

2. Method

The definition and assessment process of the PEOs for degree programmes at FKE has been established as shown in Fig. 1.

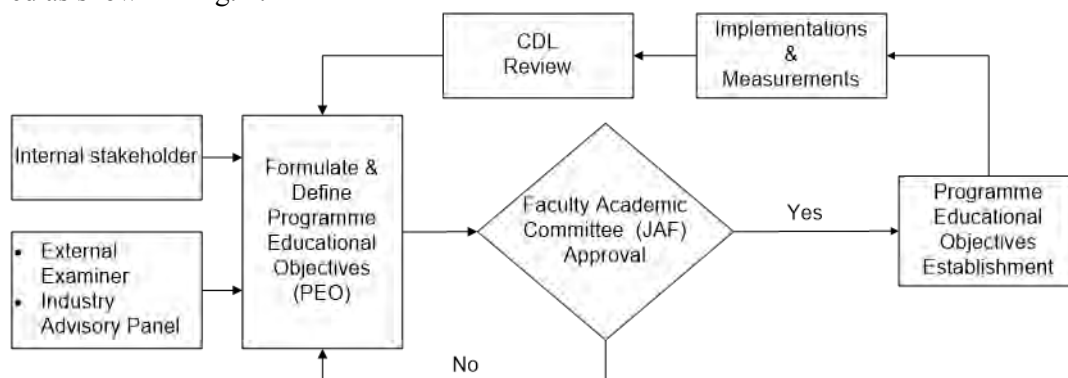


Fig. 1 Definition and Assessment Process of the PEOs

In the first stage of the process, formulation, and definition of PEOs and performance indicators, related activities to be performed and responsibility for each activity were established. The assessment method is then specified and the questionnaires for the survey were developed. In the second stage, the survey was conducted and the results were analysed. In the last stage, the analysis was presented at the Faculty Academic Committee Meeting for approval and direction for all programmes to take necessary actions. The programme will then recommend the necessary actions to be taken and take the appropriate actions to close the loop.

In 2014, a workshop was conducted to plan the activities related to PEO assessment and evaluation at FKE. Table 1 shows the planned activities for the assessment and evaluation of PEOs.

Table 1. Assessment and Evaluation Activities

Assessment and Evaluation Activities (AEA)	Yr 1 2014	Yr2 2015	Yr3 2016	Yr4 2017	Yr5 2018	Yr6 2019
1. Review of performance indicators that define the objectives	√			√		
2. Map educational strategies related to performance indicators	√			√		
3. Review mapping and identify where data will be collected	√			√		
4. Develop and/or review assessment methods used to assess performance indicators	√			√		
5. Collect and analyse data		√			√	
6. Evaluate assessment data including Processes			√			√
7. Report findings			√			√
8. Take actions where necessary			√			√

At the same workshop, the performance indicators for the programmes at FKE have been established. Table 2 shows the performance indicator for the PEOs.

Table 2. Performance Indicator of the PEOs

Programme Educational Objectives (PEOs)	Description	Performance Indicator
PEO1 Demonstrate competency in the professional career and contribute towards engineering profession in related filed of electrical engineering practice	<ul style="list-style-type: none"> •Obtain solutions to electrical engineering problems •Provide quality services to engineering related industries •Responsible in diversified engineering practices such as design, planning, servicing, maintaining, managing system, making modification •Recognized as advisor in solving engineering related issues 	<ul style="list-style-type: none"> • 70% of the graduates work as electrical & electronics engineer or work in engineering field
PEO2 Engage in multidisciplinary professional filed within a global and societal context	<ul style="list-style-type: none"> •Well-rounded engineers with effective decision to provide quality services to engineering related industries •Become human workforce contributing to economic, environmental and professional practices • Become responsible individuals who consistently instill code of ethics and ethical behavior at the workplace and society at large 	<ul style="list-style-type: none"> • 40% of the graduate's work in multidisciplinary professional fields • 20% of the graduates work in multinational companies
PEO3 Engage in professional development through advanced degree, research, consultancy and/or professional studies	<ul style="list-style-type: none"> •Participate in professional course/training relevant to his/her career development •Impact the knowledge and skills acquired through professional courses/training •Play an active role towards sustainable development of the community through professional practices 	<ul style="list-style-type: none"> • 50% of the graduates undertake personal development

- Become educated citizens, sensitive towards social impact, and giving benefit to the nation or global community

The first part of the questionnaires is shown Fig. 2 while the second part is based on the description for the PEOs. The survey was conducted as online survey in 2015 for the first cohort that graduated in 2012. An evaluation tool was developed to analyse the responses obtained from the surveys. The tool, named as PEO Evaluation Tool (PEOE VAT) was developed using Microsoft's Excel.

PEO 1: Demonstrate competency in the professional career and contribute towards engineering profession in related field of electrical/electronic engineering practice

1. What is your job title?

- Engineer
- Senior Engineer
- Sales Engineer
- Manager (Technical)
- Manager (Operation)
- President/Vice President
- Non-engineering related

PEO1 - If one of them are selected, PEO1 is achieved

PEO1 - If one of them are selected, PEO1 is not yet achieved, we have to look at Q1 of PEO2

2. How many years have you worked as an engineer? _____ years

Not applicable/Not working as engineer

PEO 2: Engage in multidisciplinary professional field within global and societal context

1. What industry do you work in?

- Electrical/Electronic Engineering
- Other Engineering
- Business/Finance
- Entrepreneur
- Other (please specify): _____

PEO1 - Take this Q1 for PEO1, OR it with Q1 of PEO above.

2. Type of employer/Company?

- National
- International

PEO2 - Take this Q2 for PEO2 20% multinational measurement.

PEO 3: Engage in professional development through advance degree, research, consultancy and/or professional studies

1. Please select the personal development taken after graduation:

- Postgraduate programme (Msc/PhD)
- Professional Courses
- Masters in Business Administration (MBA)
- Non-Professional Courses
- On Job training
- Other: _____

PEO3 - Take this Q1 for PEO3, OR it with PEO3 in page 3.

2. Are you a Certified Engineer? Yes No

Fig. 2 Part of the questionnaires

3. Results and Discussion

32 responses were obtained from the alumni survey for the first cohort graduated in 2012 with Bachelor of Engineering (Hons) Electrical Engineering. All the responses from the survey were analysed using PEOEVAT and the findings obtained based on the description of each PEOs were summarized as shown in Table 3 to Table 5.

Table 3. Responses for PEO1

PEO	Description	Responses (Agree and Strongly Agree)
PEO1 Demonstrate competency in the professional career and contribute towards	a. I obtain solutions to electrical engineering problem	78.13%
	b. I provide quality services to engineering related industries	75%

engineering profession in related field of electrical/electronic engineering practice	c. I am responsible in diversified engineering practices such as design, planning, servicing, maintaining, managing system, making modification	68.75%
	d. I am recognized as advisor in solving engineering related issues	59.38%

Table 4. Responses for PEO2

PEO	Description	Responses (Agree and Strongly Agree)
PEO2 Engage in multidisciplinary professional field within global and societal context	a. I provide effective decision in order to provide quality services to society, industry or global organization	78.13%
	b. I contribute to economic, environmental and professional practices	82.25%
	c. I practice and promote code of ethics and ethical behavior at the workplace and society at large	84.38%

Table 5. Responses for PEO3

PEO	Description	Responses (Agree and Strongly Agree)
PEO3 Engage in professional development through advance degree, research, consultancy and/or professional studies	a. I participate in professional course / training relevant to my career development	53.13%
	b. I impart the knowledge and skills acquired through professional courses / training	68.75%
	c. I play an active role towards sustainable development of the community through professional practices	68.75%
	d. I am an educated citizen, sensitive towards social impact, and giving benefit to the nation or global community	78.13%

For PEO1, the results show that 68.75% of the graduates are responsible in diversified engineering practices such as design, planning, servicing, maintaining, managing system, making modification while 59.38% have been recognized as advisor in solving engineering related issues. More than 70% of the graduates provide solutions to electrical engineering problem and quality services to engineering related industries. These data show that graduates can achieve the targeted PEO1 just in three years after graduated.

The findings also show that the graduates' performance in obtaining the targeted description of PEO2 is better as 78.13% of the graduates provide effective decision in order to provide quality services to society, industry or global organization and more than 80% of the graduates contribute to economic, environmental and professional practices, practice and promote code of ethics and ethical behavior at the workplace and society at large.

In recognition of professional development, i.e. lifelong learning, more than 50% of the graduates participate in professional course/training relevant to their career development while 68.75% of them impart the knowledge and skills acquired through professional courses/training.

The results obtained for the first and second parts of the questionnaires were used to analyse the overall performance of the PEOs based on the performance indicator. The finding is shown in Table 6.

Table 6. Overall Performance of the PEOs

PEO INDICATOR	TARGET	% OF PEO ACHIEVEMENT	STATUS
PEO 1: Graduates are competence in their professional career and contribute towards engineering profession in related field of electrical engineering practices.	70%	91%	ACHIEVED
PEO 2: Graduates work in multidisciplinary professional fields.	40%	84%	ACHIEVED
PEO 2: Graduates work in multinational companies.	20%	25%	
PEO 3: Graduates have professional development taken after graduation.	50%	75%	ACHIEVED

Table 6 shows that the overall performance of the graduates for all PEOs achieved the target as stated in the performance indicator.

The above results were presented to the faculty members, industrial advisory panel, external examiners, and accreditation panel. Suggestions for continual improvement includes revise of questionnaires and to improve number of respondents. These suggestions have been employed by the faculty in the CQI process of the assessment and evaluation of PEOs. Several workshops have been carried to improve the questionnaires and to increase the number of respondents. The improved questionnaires have been used in the alumni and employer survey conducted in 2018.

4. Conclusion

This study shows that the assessment and evaluation of PEOs for the graduates of Bachelor of Engineering (Hons) Electrical Engineering at Faculty of Electrical Engineering, Universiti Teknologi MARA, Shah Alam has been conducted systematically. The analysis of results obtained show that the graduates are able to attain the specified PEOs. Identification for improvements through the PEO measurements and analysis of the results allows the CQI to be carried out..

5. Suggestion for Future Research

The CQI process of the assessment and evaluation of PEOs in the faculty involved the input from various stakeholders. Future research should include details of the suggestions and the improvement that have been done. The findings of the PEO evaluation as the results of the CQI process should also be emphasised in the future research.

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