



Programmes Educational Objectives (PEO) Achievement for Diploma in Mechanical Engineering at Politeknik Muadzam Shah

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Abstract

Programme Educational Objectives (PEO) are specific goals consistent with the mission and vision of the expressed interest of programme stakeholders describing the expected achievements of graduates in their career and professional life after graduation. Criteria of good PEOs are defined as distinctive, specific, measurable, achievable, result-oriented, and having a time frame. Diploma in Mechanical Engineering (Product Design), Diploma in Mechanical Engineering (Automation) and the Diploma in Mechanical Engineering (Automotive Manufacturing Design) are three programme offered at Department of Mechanical Engineering at Politeknik Muadzam Shah. To answer the question of the study, the reviewers used Dichotomous question or Close-ended question to answer all the PEO regarding the respondent's work in the field of engineering, professional ethics, enterprising activities that apply engineering knowledge and successful career advancement. The objectives of the programmes should produce balanced TVET graduates that are set across four PEOs. The survey was prepared by the Department of Mechanical Engineering, Politeknik Muadzam Shah and was opened for responses in late 2022. The data analysed consists of target respondents consisting of 151 graduates from the years 2017, 2018, and 2019 of the Mechanical Engineering Department at Politeknik Muadzam Shah. This study found that PEO1 competent in knowledge and skills in the field of mechanical engineering according to industry standards in all diploma programme related fields and meets department KPIs of more than 35%. The finding for PEO2 indicates that the graduates are able to communicate with colleagues well, and the result for PEO3 indicates that the graduates recognise the importance of sharing their responsibility through engagement with the community, with more than 95% of alumni from DRP, DMA and DRA programmes having contributed to society with professional ethics and responsibilities. Lastly, in terms of PEO4, the graduates have successfully participated in entrepreneurship activities. Meanwhile, more than 20% of graduates want to pursue studies at a higher level (degree or professional certificate).

Keywords: Education; lifelong learning; graduates

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1. Introduction

The Program Educational Objectives (PEO) are specific goals consistent with the mission and vision of the expressed interest of programme stakeholders describing the expected achievements of graduates in their career and professional life after graduation. (Ab-Rahman et al., 2022). Good PEOs are defined as distinctive, specific, measurable, achievable, result-oriented, and having a time

frame. All educational institutions in Malaysia need to measure PEOs (Hairi et al., 2019).

For all engineering programmes in Malaysia, the offering institution is required to implement the Outcome-Based Education system, also known as the OBE system. Based on Jabatan Pengajian Politeknik (2013), the OBE is an educational process, which is based on trying to achieve certain specified outcomes in terms of individual student learning. Thus, having decided what the key things students should understand and be able to do or the

qualities they should develop, both structures and curricula are designed to achieve those capabilities or qualities. The design process involves the restructuring of curriculum, assessment, and reporting practises in education to reflect the achievement of high-order learning and mastery rather than the accumulation of course credits.

According to Kementerian Pengajian Tinggi (2021), the OBE assessment includes three types of outcomes or objectives, and the first is the Course Learning Outcome (CLO) that is being assessed during the semester. Secondly is the Programme Learning Outcome (PLO) that is being assessed at the end of their three-year study, and lastly, the Program Educational Objectives (PEO) that are being assessed after 3-5 years of a student's graduation date.

1.1 The Overview of Programme Educational Objectives (PEOs)

Mechanical Engineering Department, Politeknik Muadzam Shah offerS three (3) diploma programmes that are Diploma in Mechanical Engineering (Product Design) – DRP, Diploma in Mechanical Engineering (Automation) – DMA and Diploma in Mechanical Engineering (Automotive Manufacturing Design) – DRA. The objectives of the programme should produce balanced TVET graduates that are set across four (4) Programme Educational Objectives (PEOs) as indicated in Table 1.

Table 1. Programme Educational Objectives (PEO)

PEO1	Competent in knowledge and skills in the field of mechanical engineering according to industry requirement
PEO2	Effective in communication and contribute effectively as a team member with the capability of being a leader
PEO3	Ethically and socially responsible towards developing the community and the nation.
PEO4	Able to demonstrate entrepreneurship skills and recognize the need of lifelong learning for a successful career advancement and able to adapt themselves with new technological challenges in mechanical fields

1.2 Objective of Study

To carry out this study, several objectives have been identified as below:

- i. To identify the frequency ability of practicing technician in mechanical engineering related field among graduates (PEO1).
- ii. To identify the frequency ability of contributing to society with professional ethic and responsibilities among graduates (PEO2).
- iii. To identify the frequency ability of engaging in enterprising activities that apply engineering

knowledge and technical skills among graduates (PEO3).

- iv. To identify the frequency ability of engaging in activities to enhance knowledge for successful career advancement among graduates (PEO4).

2. Methodology

The alumni survey was used as an instrument or method to assess graduates' attainment of all the PEO targets. Based on the previous study by Mamat et al. (2014) using an alumni survey as one of the methods to collect the achievements of PEOs. The results of this study will provide an overview of the solutions to the research topics.

To answer the question of the study, the reviewers used Dichotomous question or Close-ended question to answer the PEO1 to PEO4 to explain the respondent's work in the field of engineering, and the questionnaire on professional ethics, communication and teamwork skills, entrepreneurship skills, and successful career advancement. According to Bista. K (2017) stated that the survey questions designed with shorter questions will maintain the respondent's motivation to fill out the survey.

In 2019, a pilot test on Programme Educational Objective (PEO) has been conducted to gain the results to indicate the frequency and percentage that is utilised as a key performance indicator (KPI) for the target achievement of PEO (Politeknik Muadzam Shah, 2019). Based on a study by Abbadeni et al. (2013), if PEO not achieved by graduates, there is probably an issue with the learning outcomes and curriculum programme. The data obtained was analysed based on the achievement of each PEO

2.1 Data Collection Method

The data analyzed consists of target respondents consisting of 151 graduates from the years 2017, 2018, and 2019 of Politeknik Muadzam Shah Mechanical Engineering Department (Unit Peperiksaan PMS, 2019). Data collection is done by using an online questionnaire, which has been applied in the form of an online survey-google form platform to make it easier for the students to fill out and answer the next questionnaire as a medium to get data from respondents.

The applications to distribute questionnaires to the graduates have been obtained through the Head of the Mechanical Engineering Department. This research questionnaire was built online at the web address link <https://forms.gle/gtGAHouty2TCokHp6>. Next, online links for this questionnaire were distributed with the help of academic advisors and students. Academic advisors and students subsequently share web addresses through Whatsapp and Telegram groups of their respective classes. Respondents have answered the questionnaire and continued to send it through the link.

There are five parts that are built into this questionnaire item, namely Part A for student demographics (respondents), Part B to evaluate students competent in knowledge and skills in the field of mechanical engineering according to industry requirements (PEO1), Part C to assess students' effectiveness in communication and contribute effectively as a team member with the capability of being a leader (PEO2), Part D to evaluate students ethically and socially responsible towards developing the community and the nation (PEO3) and Part E is to evaluate students' ability to demonstrate entrepreneurship skills and recognize the need of lifelong learning for a successful career advancement and be able to adapt themselves to new technological challenges in mechanical fields (PEO4). The distribution number of question was according to the section in this questionnaire is shown in Table 2.

Table 2. Questionnaire distribution part

Part	Item	No. of Question
A	Respondent Demographics	7
B	PEO1	2
C	PEO2	3
D	PEO3	2
E	PEO4	2

2.1.1 Data Collection for PEO 1

PEO1 is an instrument in Part B that is, knowledge and technical skills, this section includes two question items as stated below:

- i. Are you working in a job or an industry of your related to mechanical engineering discipline/field?
- ii. Does the knowledge learned in Politeknik Muadzam Shah are applied in your current position?

For Question ii, only respondents who answered 'Yes' will be considered to determine the percentage working in the field of mechanical.

2.1.2 Data Collection for PEO 2

PEO2 is a Part C instrument. Part C contains statements regarding communication and working with team member with the capability of being a leader. This part in total contains two items as described below:

- i. Are you able to communicate verbally well with colleagues?
- ii. Have you ever led a team that completing task related to your job scope or skill?

The achievement of PEO2 only considers the percentage of respondents who answered 'Yes' and 'No' to see the actual achievement percentage for the PEO2.

2.1.3 Data Collection for PEO 3

Part D is an instrument in the analysis of PEO 3. This part is about ethic and social responsibility and nation, comprises the following two question items:

- i. Have you ever practiced safety and health ethics in your workplace?
- ii. Have you ever been involved in any task, job or community service programme (CSR) related to the community society?

The achievement of PEO3 only considers the percentage of respondents who answered 'Yes' and 'No' to see the actual achievement percentage for the PEO3.

2.1.4 Data Collection for PEO 4

PEO4 is an instrument in Part E, which is entrepreneurship skills and identify the need of lifelong learning for a successful career advancement and able to adjust themselves with new technological challenges in mechanical fields. This section covers two question items as listed below:

- i. Have you ever been involved in any of the business?
- ii. Are you pursuing your study in higher level (degree / professional certificate) or have been attended any technical courses for improving the skill?

The achievement of PEO4 only considers the percentage of respondents who answered 'Yes' and 'No' to see the actual achievement percentage for the PEO4.

3. Result and Discussion

This PEO review analysis study was developed based on data from the results of questionnaires for graduates from the Mechanical Engineering Department, Politeknik Muadzam Shah who graduated in batches 2017, 2018, and 2019. This study targets the collection of data to measure the proximity of graduates to the Program Objective / Program Educational Objective (PEO). This finding is analysed based on the Modified Nominal Group Technique (MNGT) by involving the views of alumni who have graduated more than 3 years after graduation.

The justification for the use of the technique is that it is able to obtain accurate findings based on the experience of the alumni themselves as research participants. This is in line with the views of Mohd Ridhuan and Nurulrabihah (2020); Deslandes, et al. (2010), who argued that the Nominal Group Technique is able to obtain in-depth findings based on the experience of the research subjects involved, in addition to being widely used in studies that require accurate and critical findings as the basis for a decision.

3.1 Analysis of PEO of Questionnaire Method

There were about 44 respondents from DRP, 32 respondents from DMA and 75 respondents from DRA answered the PEO's survey form. The respondents were graduates that since the performance of the PEOs will only be counted for graduates with 3 to 5 years of working experience for the evaluation of the PEO's achievement.

3.1.1 Analysis of PEO 1

PEO1 identified a graduate competent in knowledge and skills in the field of mechanical engineering according to industry standard. Based on the collection data shown in Table 3, the achievement of the PEOs were based on the key performance indicator graduates and the target must more than 35%.

Table 3. Percentage achievement of PEO1

Analysis PEO 1	Achievement (%)		
	DRP	DMA	DRA
Work in the field of study	70.5%	81.3%	62.7%
Knowledge applied to work	84.1%	72.9%	80.0%

Overall, the percentage achievement for DRP, DMA and DRA programmes has met the indicator target more than 35%. In fact, about 81.3% of DMA graduates have been involved with work in the field of study. The results for DRP programmes also show that 84.1% graduate applied the learning knowledge and skill in their work. The results indicate the strength of PEO1, in which the programme has successfully produced professional workforces, capable and competently working in the field.

3.1.2 Analysis of PEO 2

PEO2 outlines the graduate's interpersonal abilities in terms of communication, teamwork, and leadership potential. Summary of the current soft skill graduate's respective to PEO2 is tabulated in Table 4 and the target for PEO2 are 20% and above.

Table 4. Percentage achievement of PEO2

Analysis PEO 2	Achievement (%)		
	DRP	DMA	DRA
Able to communicate well with colleagues	100%	100%	62.7%
Able to be a leader in managing projects	100%	100%	80.0%

The finding indicates that the graduates able to communicate with colleagues well. Graduates able to working as a team member and able to lead the project.

The percentage attainment of PEO2 have met the indicator target successfully.

3.1.3 Analysis of PEO 3

PEO3 is a contributing to society with professional ethics and responsibilities. PEO3 describes the graduate's involvement in community activities, which includes engineering and non-engineering work related to society, health and safety. During the activities, graduates instill awareness of the safety and health culture and suggest solutions pertaining to the environment and sustainability to the community. In performing the activities, the graduates adhere to professional ethics and responsibilities by following rules and regulations of the field. Table 5 shows the result indicates the strength of PEO3 and the key indicator for this PEO must more than 20%.

Table 5. Percentage achievement of PEO3

Analysis PEO 3	Achievement (%)		
	DRP	DMA	DRA
Practicing safety and health ethics at work	100%	93.8%	98.7%
Ever been involved in any community service program (CSR)	100%	96.9%	96.0%

The finding indicates that the graduates recognized the importance of sharing their responsibility through engagement with the community, with more than key indicator setting and graduate from this three diploma program have contributed to society with professional ethics and responsibilities. Overall, the percentage achievement PEO3 has met the indicator target more than the expectation.

3.1.4 Analysis of PEO 4

PEO4 related to measure entrepreneurship skills of graduate involved business. Enterprising activities can be online or offline business. It also can be pursued either full time or part time basis. Summary of the current graduate's employment involved in entrepreneurship activities respective to PEO4 is tabulated in Table 6.

PEO4 is an activity to enhance knowledge for successful career development. PEO4 describes the future achievement of the graduates. The graduates have the opportunities to further their studies to a higher level such as advanced diploma or degree. Graduates can also upgrade their knowledge by attaining professional certification. For career advancement criteria, the graduates are expected to hold senior positions such as senior technician, project manager consultant and supervisor. The PEO 4 target must be more than 5%.

Table 6. Percentage achievement of PEO4

Analysis PEO 4	Achievement (%)		
	DRP	DMA	DRA
Ever been involved in any activity entrepreneurship (business)	100%	78.1%	50.7%
Want to continue studying at a higher level (degree/professional certificate)	54.5%	71.9%	26.7%

According to the outcomes of the DRA program, almost 50.7% of graduates were engaged in entrepreneurial activity while DMA program was 78.1% and DRP program was 100%. In terms of PEO4, the graduates engaged in entrepreneurial activity was successful. In the meanwhile, more than 25% of graduates aspire to pursue higher-level education (a degree or professional certificate). Indeed, the graduates recognized the importance of participating in learning activities to expand their knowledge for a successful career in the mechanical profession. PEO4 has met its overall goal of exceeding 5% achievement target.

3.2 Discussion

A survey of four PEOs achievements for three diploma programmes offered at the Mechanical Engineering Department, Politeknik Muadzam Shah was provided to graduates who had completed their studies in 2017 till 2019, and this data was taken in 2022. The results of the analysis were compared to the Department of Polytechnic and College Community Education (DPCCE) KPI from the Curriculum Advisory Committee meeting minutes for programmes under Mechanical Engineering on 6 February 2014. These results were also compared to the department's KPI determined from the pilot test against the graduates in the June 2019 session.

The analysis found that on PEO1 achievement of a graduate competent in knowledge and skills in the field of mechanical for all diploma programmes according to industry meets department KPIs of more than 35%. All respondents agreed and supported the 35% setting for PEO1 achievement. According to Norhafezah Yusof et al (2018), the curriculum must be kept up-to-date and relevant to the industry based on industry feedback.

Through the analysis of PEO2, the graduate shows the interpersonal skills of the graduate in communication and the ability to work with team members, demonstrating the capability of being a leader. The result is that the PEO's achievement is above the departmental KPI percentage that is set at 20%.

PEO3 describes graduates who contribute to society and the nation through ethics and social responsibilities, and discovered that the DRP, DMA, and DRA programmes had achieved a departmental KPI percentage of more than 20%. High percentage contributions to the programs indicate that graduates are contributing to society with professional ethics and responsibilities.

While, PEO4 is about engaging in enterprising activities that apply to successful career advancement, shows that the department's KPI setting is only 5% due to the characteristics of this PEO4 more to involve graduates in entrepreneurial and lifelong learning. Analytical data shows that DRP, DMA, and DRA programmes have reached that percentage target. Graduates are also interested in the latest technology and installation.

4. Conclusion

Generally, the results from the surveys indicated that graduates' perceptions of their attainment of most PEOs were above the satisfactory level. For continuous quality improvements, there are still some teaching and learning methods that can be improved to Department of Mechanical Engineering, Politeknik Muadzam Shah to enhance the quality of the teaching and learning environment, and thus, improve the achievement of PEOs. Therefore, further research is suggested to be conducted in studying the instrument to measure the achievement of the PEOs for the next cohort cycle.

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