

Programme Educational Objectives (PEO) Achievement For Diploma In Mechanical Engineering (Product Design) Politeknik Muadzam Shah 2022

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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 such as distinctive, specific, measurable, achievable, result-oriented, and having a time frame. A diploma in Mechanical Engineering (Product Design) is one of the programmes offered at the Department of Mechanical Engineering at Politeknik Muadzam Shah. To answer the question of the study, the reviewers used Dichotomous or Close-ended questions to answer all the PEO regarding the respondent's work in the engineering field, professional ethics, enterprising activities that apply engineering knowledge and successful career advancement. The programme's objectives should produce balanced TVET graduates set across four PEO. The Department of Mechanical Engineering, Politeknik Muadzam Shah, prepared the survey which was opened for responses in late 2022. This PEO review analysis study was developed based on data from the results of 44 respondents for graduates of Diploma Mechanical Engineering (Produk Design) that graduated in the year 2017, 2018 and 2019. This study found that PEO1 competent in knowledge and skills in the field of mechanical engineering according to the industry in DRP related field meets department KPIs of more than 35%. The finding for PEO2 indicates that the graduates can communicate with colleagues well, and the result for PEO3 indicates that the graduates recognised the importance of sharing their responsibility through engagement with the community, with 100% of alumni from the DRP programme have contributed to society with professional ethics and responsibilities. Lastly, in terms of PEO4, the graduates have successfully participated in entrepreneurship activities. Meanwhile, 54.5% of graduates want to pursue study at a higher level (degree / professional certificate).

Keywords: education, lifelong learning, graduates

1.0 Introduction

The Outcome-Based Education (OBE) system is required of all engineering programmes in Malaysia by the Engineering Technology Accreditation Council (ETAC). According to Jabatan Pengajian Politeknik (2013), the OBE is an educational process based on achieving specific outcomes regarding individual student learning. Having decided 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. To reflect the achievement of high-order learning and mastery, the designing process involves restructuring curriculum, assessment, and reporting practices.

Referring to Kementerian Pengajian Tinggi (2021) indicated that, in general, the OBE assessment includes three types of outcomes/objectives listed below:

- i. The Course Learning Outcome (CLO) - being assessed during the semester
- ii. The Programme Learning Outcome (PLO) - being assessed at the end of their four-year study
- iii. The Program Educational Objectives (PEO) - being assessed after 3-5 years of their graduation date

The goals of the PEO are in line with the mission and vision of the programme stakeholders. Good PEOs have criteria such as being distinctive, specific, measurable, achievable, result-oriented and having a time frame. The vision of Politeknik Muadzam Shah was to be a leading-edge TVET institution. There are four missions for Politeknik Muadzam Shah specified below:

- i. To provide access to quality and recognised TVET programmes.
- ii. To empower communities through lifelong learning.
- iii. To develop holistic, entrepreneurial and balanced graduates.
- iv. To capitalise on smart partnerships with stakeholders

1.1 The Overview of Programme Educational Objectives (PEOs)

Diploma in Mechanical Engineering (Product Design) – DRP is offered at the Department of Mechanical Engineering, Politeknik Muadzam Shah. The programme's objectives 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 requirements
PEO2	Effective in communication and contributing 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 recognise the need for lifelong learning for successful career advancement and able to adapt themselves to new technological challenges in mechanical fields

1.2 Objective of Study

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

- i. To identify the frequency of ability to practice technician in mechanical engineering-related fields among graduates (PEO1).
- ii. To identify the frequency of ability to contribute to society with professional ethics and responsibilities among graduates (PEO2).
- iii. To identify the frequency of ability to engage in enterprising activities that apply engineering knowledge and technical skills among graduates (PEO3).
- iv. To identify the frequency of ability to engage in activities to enhance knowledge for successful career advancement among graduates (PEO4).

2.0 Data Collection Method

The findings of this study are intended to outline the answers to the research questions, which are to determine whether students achieve all the PEOs. To answer the study question, the reviewers used Dichotomous or closed-ended questions to answer the PEO1-PEO4 to explain the respondent's work in the engineering field, a questionnaire on professional ethics, enterprising activities that apply engineering knowledge, and successful career advancement. Data analysis from Politeknik Muadzam Shah (2019) has been used as a pilot test result carried out through the frequency distribution process to show frequency and percentage, which is used as a key performance indicator (KPI) for the achievement of PEO 2022. Data obtained from 44 respondents who graduated in 2017, 2018 and 2019 were analysed based on the achievements of each PEO. One of all items in the PEO that reaches 'Yes' will be counted as the PEO being achieved. In addition, an interview analysis was also conducted on the industry to support research findings and improvement recommendations.

2.1 Study Design

The alumni survey was used as an instrument or method to assess graduates' attainment achievement of all the PEO targets. Based The previous

study by Mamat et al. (2014) used an alumni survey, one of the methods used to collect the achievements of PEOs.

To address the subject of the review, the analysts utilised Dichotomous inquiry or closed-ended questions to address PEO1 to PEO4 and describe the respondent's work in the field of design and the poll on proficient morals, correspondence and collaboration abilities, business venture abilities, and fruitful professional success. As indicated by Bista K. (2017), the study questions planned with more limited questions will keep up with the respondent's inspiration to finish the survey questions.

The head of the Mechanical Engineering Department obtained the questionnaire applications, and at the web address <https://forms.gle/gtGAHouty2TCokHp6>, a research questionnaire was built. Following this, online links for this questionnaire were distributed with the help of academic advisors and students. Based on Unit Peperiksaan, PMS (2019), the alumni have been listed, and academic advisors subsequently share web addresses through WhatsApp and Telegram groups of their respective classes. The respondents answered the questions and sent them through the link.

Five sections are incorporated into this poll thing. Specifically, Section A for understudy socioeconomics (respondents). Part B assesses understudies in information and abilities in the field of mechanical designing as per industry prerequisites (PEO1). Part C surveys understudies' viability in correspondence and contributes as a colleague who can be a pioneer (PEO2). Part D assesses understudies as morally and socially mindful towards fostering the local area and the country (PEO3). Lastly, Part E assesses understudies' capacity to show business abilities, perceive the need for long-lasting learning for fruitful professional success, and have the option to adjust to new mechanical difficulties in mechanical fields (PEO4).

2.1.1 PEO1: Competent in Knowledge and Skills in The Field of Mechanical Engineering According to Industry Requirements

PEO1 is an instrument in Part B, i.e., knowledge and technical skills. This section includes two question items as stated below:

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

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

2.1.2 PEO2: Effective in Communication and Contribute Effectively as A Team Member with The Capability of Being a Leader.

PEO2 is a Part C instrument. Part C contains statements regarding communication and working with a team member who can be 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 completed a task related to your job scope or skill?

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

2.1.3 PEO3: Ethically and socially responsible towards developing the community and the nation

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

- i. Have you ever practised 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' questions to see the actual achievement percentage for the PEO3.

2.1.4 PEO4: Able to Demonstrate Entrepreneurship Skills and Recognise the Need for Lifelong Learning for A Successful Career Advancement and Able to Adapt Themselves to New Technological Challenges in Mechanical Fields

PEO4 is an instrument in Part E, which is entrepreneurship skills and identifying the need for lifelong learning for successful career advancement and adjusting to 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 at a higher level (degree / professional certificate), or have been attended any technical courses to improve your skill?

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

3.0 Results and Analysis Data

The PEO review analysis study was developed by the Department of Mechanical Engineering, Politeknik Muadzam Shah, and given to the graduates of the Diploma in Mechanical Engineering (Produk Design) that graduated in batches 2017, 2018, and 2019.

This study targets the collection of data to measure the proximity of graduates to the Program Objective (PO) / 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 three years after graduation.

The MNGT technique can get accurate findings from alumni experience as research respondents. Deslandes et al. (2010) and Mohd Ridhuan & Nurulrabihah (2020) also argued that the Nominal Group Technique could 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

Based On The graduates in batch 2017, 2018 and 2019 were given a questionnaire to answer, and about 44 total respondents answered the PEO's survey form. The respondents were selected to measure the performance of PEOs because the evaluation of the PEO's achievement must be 3 to 5 years of working experience.

3.1.1 PEO1: Competent in Knowledge and Skills in The Field of Mechanical Engineering According to Industry Requirements

PEO1 describes a graduate competent in knowledge and skills in mechanical engineering according to industry requirements. Based on the collection data shown in Table 2, the achievement of the PEOs was based on the key performance indicator of DRP graduates.

Table 2: Percentage achievement of PEO1 for the DRP programme

PEO 1	ANALYSIS PEO	Achievement (%)	
		DRP	
		T	A
Competent in knowledge and skills in the field of mechanical engineering according to industry requirement	Work in the field of study	>35%	70.5%
	Knowledge applied to work		84.1%

***T – Target, A – Achievement**

Overall, the percentage achievement for the DRP programme has met the indicator target of more than 35%. About 70.5% of DRP graduates have been involved with work in the mechanical or product design field. The results for the DRP programme also show that 84.1% of graduates applied the learning knowledge 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 PEO2: Effective in communication and Contribute Effectively as a Team Member with The Capability of Being a Leader.

PEO2 describes the interpersonal skills of the graduate in communication and able working with a team member, then the capability of being a leader. A summary of the current soft skill graduates respective to PEO3 is tabulated in Table 3.

Table 3: Percentage achievement of PEO2 for the DRP programme

PEO 2	ANALYSIS PEO	Achievement (%)	
		DRP	
		T	A
Effective in communication and contributing effectively as a team member with the capability of being a leader.	Able to communicate well with colleagues	>20%	100%
	Able to be a leader in managing projects		100%

***T – Target, A – Achievement**

The finding indicates that the graduates can communicate with colleagues well. Graduate and be able to work as a team member and project leader. The percentage attainment of PEO2 met the indicator target successfully.

3.1.3 PEO3: Ethically and Socially Responsible Towards Developing the Community and The Nation

PEO3 contributes to society with professional ethics and responsibilities. PEO3 describes the graduate's involvement in community activities, including engineering and non-engineering work related to society, health and safety. During the activities, graduates instil awareness of the safety and health culture and suggest environmental and environmental sustainability solutions to the community. In performing the activities, the graduates adhere to professional ethics and responsibilities by following the rules and regulations of the field. Table 4 shows the result indicates the strength of PEO2, in which all programmes have successfully performed the appropriate ethical responsibility.

Table 4: Percentage achievement of PEO3 for the DRP programme

PEO 3	ANALYSIS PEO	Achievement (%)	
		DRP	
		T	A
Ethically and socially responsible towards developing the community and the nation	Practising safety and health ethics at work	>20%	100%
	Ever been involved in any community service program (CSR)		100%

***T – Target, A - Achievement**

The result indicates that the graduates recognised the importance of sharing their responsibility through engagement with the community, with 100% of alumni from the DRP programme contributing to society with professional ethics and responsibilities. Overall, the percentage achievement of PEO3 has exceeded the indicator target.

3.1.4 PEO4: Able to Demonstrate Entrepreneurship Skills and Recognise the Need for Lifelong Learning for A Successful Career Advancement and Able to Adapt Themselves to New Technological Challenges in Mechanical Fields

PEO4 is related to measuring the entrepreneurship skills of graduates involved in business in engineering and technical projects. Enterprising activities can be online or offline business. It also can be pursued either full-time or part-time basis. A summary of the current graduate's employment in entrepreneurship activities respective to PEO4 is tabulated in Table 5.

PEO4 is an activity to enhance knowledge for successful career development. PEO4 describes the future achievement of the graduates. The graduates can further their studies at a higher level, such as an advanced diploma, degree, master's, or PhD. 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.

Table 5: Percentage achievement of PEO4 for the DRP programme

PEO 4	ANALYSIS PEO	Achievement (%)	
		DRP	
		T	A
Able to demonstrate entrepreneurship skills and recognise the need for lifelong learning for successful career advancement and able to adapt themselves to new technological challenges in mechanical fields	Ever been involved in any activity entrepreneurship (business)		100%
	Want to continue studying at a higher level (degree / professional certificate)	>5%	54.5%

***T – Target, A - Achievement**

The outcomes for the DRP programme, respectively, showed approximately 100% of graduates involved in entrepreneurship activities. In terms of PEO4, the graduates have successfully participated in entrepreneurship activities. Meanwhile, 54.5% of graduates want to pursue study at a higher level (degree / professional certificate). Indeed, the graduates recognised the importance of engaging in activities to enhance knowledge for successful career advancement in the mechanical field. Overall, PEO4 successfully achieved more than the 5% achievement target.

4.0 Discussion and Conclusion

A survey of PEOs' (PEO1-PEO4) achievements for the DRP programme offered at Politeknik Muadzam Shah was provided to graduates who had completed their studies in 2017 through 2019. This data was taken during the year 2022. The analysis results were compared to the Department of

Polytechnic and College Community Education (DPCCE) KPI determined from the result of the Curriculum Advisory Committee meeting minutes for programmes under Mechanical Engineering on February 6, 2014.

Table 6: Summary percentage achievement of all PEO for the DRP programme

PEO	STATEMENT	KPI TARGET (%)	PERCENTAGE SCORE	RESULT
PEO 1	Competent in knowledge and skills in the field of mechanical engineering according to industry requirements	35.0%	77.3%	Accomplished
PEO 2	Effective in communication and contributing effectively as a team member with the capability of being a leader	20.0%	100.0%	Accomplished
PEO 3	Ethically and socially responsible towards developing the community and the nation	20.0%	100.0%	Accomplished
PEO 4	Able to demonstrate entrepreneurship skills and recognise the need for lifelong learning for successful career advancement and able to adapt themselves to new technological challenges in mechanical fields	5.0%	77.3%	Accomplished

The analysis found that PEO1 competent in knowledge and skills in the field of mechanical engineering according to the industry in DRP related field

meets department KPIs of more than 35%. All respondents agreed and supported the 35% setting for PEO1 achievement. Norhafezah Yusof et al. (2018) stated that the educational program should be updated with the latest and pertinent to the business in light of industry criticism.

The analysis of PEO2 shows the graduate's interpersonal skills in communication, ability to work with a team member, and the capability of being a leader. The resulting achievement for this PEO is above the departmental KPI percentage set as 20%.

PEO3 describe graduate contributing to society and the nation with ethics and social responsibilities and found that the DRP program had reached a departmental KPI percentage of over 20%. A high percentage of contributions to the programs indicates that graduates contribute to society with professional ethics and responsibilities.

Although PEO4 is about engaging in enterprising activities that apply, 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 programs have reached that percentage target. Graduate also interested in the latest technology and installation.

5.0 Conclusion

This study shows that graduates' responses to their PEOs are above satisfactory levels. This study's first objective (PEO1) shows that 77.3% of the graduates can practice as technicians in mechanical engineering-related fields. In addition, 100% of graduates can contribute to society through professional ethics and responsibilities (PEO2).

On behalf of this study's third objective (PEO3), 100% of the graduates can engage in entrepreneurial activities that apply engineering knowledge and technical skills. Last but not least, the fourth objective (PEO4) demonstrates that 77.3% of graduates can engage in activities that will help them advance in their careers.

On the other hand, some teaching and learning methods can still be developed to improve the quality of teaching and learning in the Department of Mechanical Engineering, Politeknik Muadzam Shah. Further research is needed to measure the achievement of the PEOs for the next cohort cycle.

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