Assessment of Outcome-Based Education Implementation: A Case Study of Diploma Program in Electronic Engineering (Communication) at Politeknik Mukah

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Abstract

Outcome-Based Education (OBE) must be implemented in all academic programmes in Malaysia to fulfill the standards specified by the Malaysian Qualification Agency (MQA) and The Engineering Technology Accreditation Council (ETAC). This study evaluates the implementation of Outcome-Based Education (OBE) in Malaysian academic programs, focusing on the Diploma in Electronic Engineering (Communication) (DEP) program at the Department of Electrical Engineering, Politeknik Mukah, Sarawak. One part of the OBE that needs to be measured is Programme Educational Objectives (PEOs). PEOs are broad statements describing graduates' expected achievement within three to five years of graduation. Through a questionnaire distributed to 2018 graduates of the Diploma in Electronic Engineering (Communication) (DEP) program, the research assesses the achievement of Programme Educational Objectives (PEOs). Results indicate satisfactory attainment of PEO 1, with 69.23% of graduates employed as technicians in relevant fields, while PEO 2 achieved a commendable 100% success rate, reflecting graduates' contributions to society with professional ethics. However, PEO 3's accomplishment was lower at 46.15%, suggesting room for improvement in entrepreneurial engagement. Conversely, PEO 4 saw a perfect 100% achievement, indicating graduates' active pursuit of knowledge enhancement for career advancement. Overall, the findings underscore effective OBE implementation, facilitated by collaboration among stakeholders, in aligning with prescribed educational objectives.

Keywords: - Electronic engineering (communication), program education objectives, programme outcomes and outcome-based education

1. Introduction

The Malaysian higher education system has experienced remarkable growth in recent decades, with increased student enrollment and global recognition in research, patents, and institutional quality, making Malaysia a sought-after destination for international students (Saharudin et al., 2021; Omar et al., 2022). In this rapidly developing nation, higher education institutions, including technical and vocational education and training (TVET) providers, play a crucial role in driving socioeconomic progress by boosting national productivity (Gyimah, 2020). Improvements in vocational training content contribute significantly to human capital development, cultivating a skilled workforce and bolstering Malaysia's competitiveness in the global economy (Karim & Said, 2024). Furthermore, ongoing enhancements and skill development within the education system transform technical colleges into hubs for nurturing creative and innovative learners who can effectively contribute to the nation's economic growth and prosperity.

Established in 1969, Politeknik Mukah has been a leader in Technical and Vocational Education and Training (TVET), meeting the nation's demand for highly skilled professionals. Aligned with the Polytechnic Transformation Programme initiated in 2010, the institution has undertaken various initiatives aimed at providing quality, relevant, and responsive polytechnic education to meet the challenges of globalization and the demands of a high-income economy. With 36 polytechnics across Malaysia, offering diploma, advanced diploma, and bachelor-level programs in various fields, Politeknik Mukah (PMU), as the 20th Polytechnic in Malaysia and the third in Borneo, stands out with its modern infrastructure and educational facilities.

The Department of Electrical Engineering (JKE) at Politeknik Mukah offers rigorous and high-quality diploma programs infused with TVET skills. Led by experienced faculty, the department prepares students for roles in industry by imparting both theoretical knowledge and practical skills. With a mission to provide quality TVET programs and foster holistic and entrepreneurial graduates, the Department aims to

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be a leading-edge TVET institution. The Diploma in Electronic Engineering (Communication) at Politeknik Mukah is a comprehensive program covering various aspects of electronics engineering, with a specialization in communication technology. Graduates of this program are equipped to pursue diverse career paths in fields such as engineering, marketing, and technical supervision.

Structured around four Program Educational Objectives (PEOs), the Diploma in Electronic Engineering (Communication) program at Politeknik Mukah aims to produce graduates who excel as technicians, contribute to society with professional ethics, engage in entrepreneurial activities, and enhance their knowledge for successful career advancement. This introduction lays the groundwork for further exploration into the assessment of Outcome-Based Education implementation within the context of the Diploma Program in Electrical and Electronic Engineering at Politeknik Mukah.

Aligned with the imperatives of the Industrial Revolution 4.0 and the imperatives of Green Technology and Sustainable Development, the educational programs offered are meticulously crafted to address the evolving needs of industries (Shahroom & Hussin, 2018; Lase, 2019). Accredited by both the Malaysian Qualification Agency (MQA) and The Engineering Technology Accreditation Council (ETAC), these full-time programs, spanning six semesters of coursework and one semester of industrial training, are meticulously designed to impart technical expertise while nurturing holistic development through courses encompassing Islamic studies, moral studies, soft skills, and entrepreneurship (Rahimullah et al., 2020; Izzah & Rohani, 2023).

The Electrical Engineering department is committed to ensuring graduates are equipped to tackle real-world challenges as adept and proficient engineering professionals. Thus, the department is tasked with verifying graduates' alignment with program educational objectives (PEOs), with assessments slated three to five years post-graduation (Rahman et al., 2016; Ab-Rahman et al., 2022; Hadi et al., 2023). To facilitate this, the Department of Polytechnic and Community College Education has devised an assessment process, delineated in a companion document titled "Programme Educational Objectives (PEO) Assessment for Polytechnic Malaysia, Electrical and Electronics Engineering Programmes".

This survey aims to evaluate the attainment of PEOs across polytechnic programs, ensuring adherence to the philosophy of Outcome Based Education (OBE) and the preset program objectives mandated by the Department of Polytechnic Education, Ministry of Education Malaysia (Outcome Based Education, 2020). The insights garnered will not only inform enhancements in education and training quality at Malaysian Polytechnics but also guide future program planning endeavors. Thus, Polytechnic Alumni are encouraged to complete and submit this questionnaire to the Electrical Engineering Unit, Curriculum Division, Department of Polytechnic and Community College Education, contributing to the continual enhancement of educational standards and the advancement of polytechnic programs.

2. Data Collection Method

The process of measuring Programme Educational Objectives (PEOs) involves a structured series of steps aimed at assessing the attainment of educational objectives within the Diploma in Electrical and Electronic Engineering program. Firstly, the development of the PEO assessment instrument is initiated, followed by its circulation to graduating students. Through this process, feedback on the instrument's effectiveness and clarity is gathered, facilitating refinement for optimal utility. Subsequently, a pilot test is conducted to gauge the instrument's reliability and validity.

Upon completion of the pilot test, a study report is generated to document findings and insights. This report serves as a foundation for setting target percentages for each PEO, based on raw data collected during the pilot tests. These targets provide benchmarks for evaluating the degree to which educational objectives are met. Following this, improvements to the PEO instrument are implemented to address any identified shortcomings or areas for enhancement.

Once the instrument is refined, its accuracy is verified through a validation process. The improved instrument is then distributed to graduating students, ensuring comprehensive data collection. Upon completion of data collection, rigorous analysis is conducted to derive meaningful insights regarding PEO attainment. This analysis culminates in the preparation of an achievement report, summarizing findings and conclusions.

The next step involves presenting the results to the Program Advisory Committee, a crucial stakeholder group tasked with providing feedback and guidance on program effectiveness. This collaborative engagement ensures that the assessment process remains aligned with program objectives and stakeholder expectations. Additionally, triangulation of data is performed, integrating feedback from the Program Advisory Committee to enhance the robustness and reliability of the analysis.

Finally, the comprehensive report detailing the PEO measurement process and outcomes is submitted to the Electrical Engineering Unit, Curriculum Division, Department of Polytechnic and Community College Education. This marks the culmination of a meticulous and systematic approach to assessing PEOs, with the goal of enhancing program quality and efficacy.

The flow charts with instruments for Program Educational Objective (PEO) are shown in Fig. 1 until Fig. 4.

PEO1: Practicing Technician in Electrical Engineering Related Field

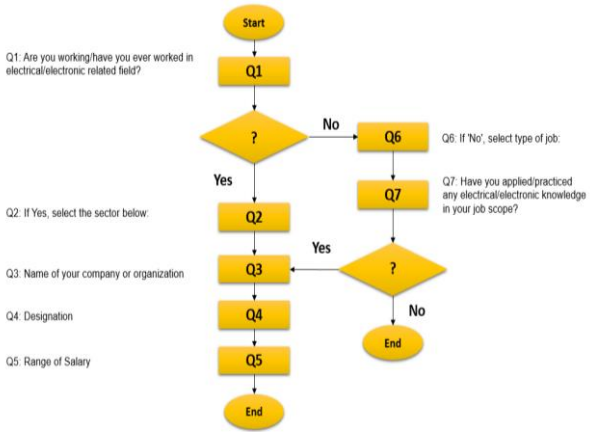

Fig. 1. Flow chart for the instrument PEO 1

PEO 2: Contributing To Society with Professional Ethics and Responsibilities

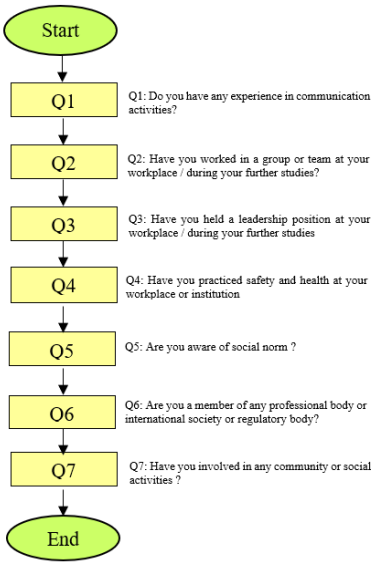

Fig. 2. Flow chart for the instrument PEO 2

PEO 3: Engaging In Enterprising Activities That Apply Engineering Knowledge and Technical Skills

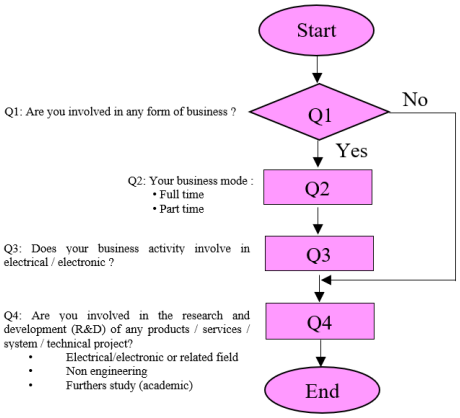

Fig. 3. Flow chart for the instrument PEO 3

PEO 4: Engaging In Activities to Enhance Knowledge For Successful Career Advancement

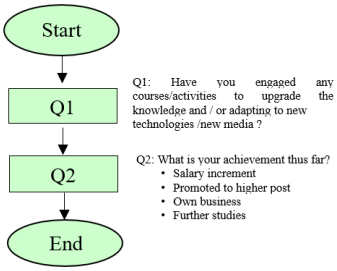

Fig.4. Flow chart for the instrument PEO 4

3. Result and Discussion

This section presents the research findings, organized into seven sub-sections. The first sub-section provides an introductory overview, followed by the profile of respondents in the second sub-section. Sub-sections three to six analyze PEOs 1 through 4, respectively. Finally, sub-section seven discusses the overall achievement of PEOs.

3.1 Profile of Respondents

The PEO instrument questionnaire was sent out to all 2018 graduates of the Diploma in Electronic Engineering (Communications) (DEP), encompassing both the December 2017 and June 2018 sessions, via a Google Form. Students were given a one-month window to complete the survey. Out of the 31 eligible graduates (17 from December 2017 and 14 from June 2018), only 26 responded, leaving 7 graduates who did not participate.

From the demographic profile of the respondents. Female respondents (73.08%) outnumbered male respondents (26.92%). Half of the respondents graduated in December 2017, while the other half graduated in June 2018. Furthermore, most respondents (73%) are currently employed, with 11.5% self-employed, 7.7% pursuing further studies, and another 7.7% unemployed.

3.2 Analysis of PEO 1 Achievement

a) PEO 1: Practicing Technician in An Electrical Engineering-Related Field

Table 1 presents the research findings for Program Educational Objective (PEO) 1, which aims to produce practicing technicians in electrical engineering-related fields. According to Fig. 5, 39% of respondents work in electrical/electronic fields, while 46% work in other areas, and 15% are either furthering their studies or unemployed.

Table 1. Research findings for PEO 1

Instrument	Number of Respondents (*n*)
Item 1: Are you working / have you ever worked in electrical / electronic related field?	
• Yes	10
• No	12
• *NA	4
Item 2: If yes, select the sector below:	**(*n* = 10)**
• Engineering	6
• Manufacturing	1
• Education	0
• Information Technology (Computing)	0
• Sales and Marketing	0
• Transporting (Logistic)	0
• Security (Defense)	0
• Services	0
• Telecommunication	1
• Training (Consultation)	0
• other	2
Item 3: By that, please choose sector below:	**(*n* = 12)**
• Business	4
• Services	4
• Digital economy (YouTube / Social Influencer / Media Content Creator)	1
• Other	3
Item 4: Have you applied / practiced any electrical / electronic knowledge in your job scope?	**(*n* = 12)**
• Yes	8
• No	4
Item 5: Current position	**(*n* = 26)**
• Technician	6
• Senior Technician	0
• Supervisor	1
• Assistant engineer	2
• Administration officer	1
• Other	12
• *NA	4
Item 6: Range of salary	**(*n* = 12)**
• Less than RM 2000	14
• RM 2001 - RM 3000	7
• More than RM 3000	1
• *NA	4
Achievement of PEO 1	
YES	18
NO	4
*NA	4

*NA= Further Study and Unemployed

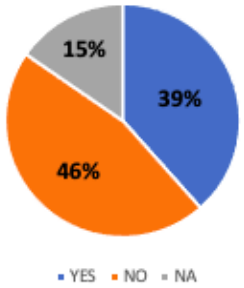

Fig. 5. Percentage of graduates worked in electrical/ electronic related field

Fig. 6 illustrates the distribution of graduates across different sectors within the electrical and electronics field. Most respondents (60%) are employed in the Engineering sector, with smaller proportions in Manufacturing (10%), Telecommunication (10%), and other sectors (20%). Conversely, no respondents are working in sectors such as Education, Information Technology, Sales and Marketing, Transportation, Security, Services, or Training.

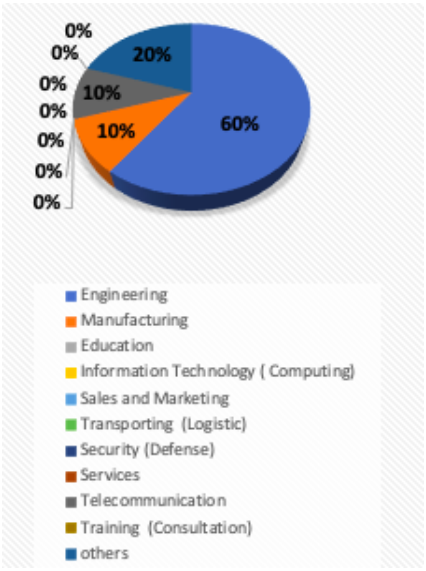

Fig. 6. Sector in electrical and /or electronic field

PEO 1 corresponds to Program Learning Outcome (PLO) 1 through PLO 5, encompassing the application of knowledge in mathematics, science, engineering fundamentals, problem identification and analysis, solution design, investigation, and the application of appropriate techniques and tools to engineering problems, all while considering various societal and environmental factors.

3.3 Analysis of PEO 2 Achievement

a) PEO 2: Contributing to Society with Professional Ethics and Responsibilities

Table 2 presents the research findings for Program Educational Objective (PEO) 2, which focuses on

graduates' contributions to society with professional ethics and responsibilities. Graduates engage in community activities encompassing both engineering and non-engineering tasks related to societal well-being, health, and safety. During these activities, graduates promote safety and health awareness, suggest solutions for environmental sustainability, and adhere to professional ethics and regulations governing their field.

Table 2. Research findings for PEO 2

Instrument	Number of Respondents (*n*)
Item 1: Do you have any experience in communication activities? (eg. report or new media or electronic media writing/ presentation / being a panel or speaker or chairperson for any event)	**(*n* = 26)**
• Yes	10
• No	14
• NA	2
Item 2: Have you ever worked in group or team at your workplace / during your further studies?	**(*n* = 26)**
• Yes	23
• No	1
• NA	2
Item 3: Have you held a leadership position at your workplace (eg: manage a team / give instructions to colleague) / during your further studies (eg: demonstrate procedure / lab group leader)?	**(*n* = 26)**
• Yes	14
• No	10
• NA	2
Item 4: Have you practiced safety and health at your workplace or institution (e.g.: personal protective equipment (PPE) / safety standard operating procedure (SOP) / fire drill)?	**(*n* = 26)**
• Yes	23
• No	1
• NA	2
Item 5: Are you aware of social norm (e.g.: corruption / bribery / breach of trust)?	**(*n* = 26)**
• Yes	22
• No	2
• NA	2
Item 6: Are you a member of any professional body or international society or regulatory body (e.g.: BEM/ MBOT/ IEEE / IEM/ MySet/ CIDB)?	**(*n* = 26)**
• Yes	9
• No	17
Item 7: Have you involved in any community or social activities (e.g.: communal work / Corporate Social Responsibility activities / social work / NGOs)?	**(*n* = 26)**
• Yes	18
• No	8
Achievement of PEO 2	
Yes	26
No	0

*NA= Further Study and Unemployed

Fig. 7 shows the achievement of PEO 2, revealing that 100% of respondents have attained this objective. This outstanding achievement underscores the effectiveness of the program in instilling professional ethics and societal responsibility. PEO 2 aligns with Program Learning Outcomes (PLO) 6 to 8, emphasizing knowledge of societal issues, sustainability, and commitment to professional ethics and norms.

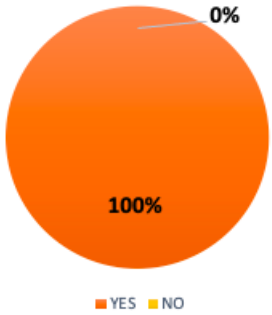

Fig. 7. Achievement of PEO 2

3.4 Analysis of PEO 3 Achievement

a) PEO 3: Engaging in Enterprising Activities That Apply Engineering Knowledge and Technical Skills

Table 3 presents the research findings for Program Educational Objective (PEO) 3, which focuses on graduates' engagement in enterprising activities by applying engineering knowledge and technical skills. This includes involvement in business ventures, research and development (R&D), and new technical projects, necessitating effective communication and teamwork. Graduates may participate in online or offline businesses, either on a full-time or part-time basis.

From the research findings, 50% of respondents are involved in business activities, with 38% working full-time and 62% part-time. Among those engaged in business, 54% operate in the electrical/electronic field, while 35% are involved in R&D related to electrical/electronic products or services. Additionally, 46.15% of respondents have achieved PEO 3, as shown in Fig. 8.

Table 3. Research findings for PEO 3

Instrument	Number of Respondents (*n*)
Item 1: Are you involved in any form of business (online / offline)?	**(*n* = 26)**
• Yes	13
• No	13
Item 2: Your business mode:	**(*n* = 13)**
• Full time	5
• Part time	8
Item 3: Does your business activity involve in electrical / electronic	**(*n* = 13)**
• Yes	6
• No	7
Item 4: Are you involved in the research and development (R&D) of any products / services / system / technical project? (e.g.: market survey, improve quality product, innovation business, process improvement)	**(*n* = 26)**
• Electrical/electronic or related field	9
• Non engineering	14
• Furthers study (academic)	3
Achievement of PEO 3	
Yes	12
No	14

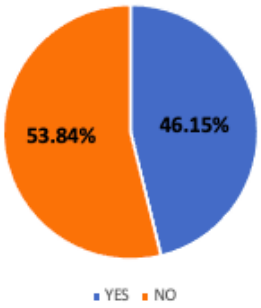

Fig. 8. Achievement of PEO 3

PEO 3 aligns with Program Learning Outcomes (PLO) 9 to 11, emphasizing effective teamwork, communication skills, and understanding of engineering management principles.

3.5 Analysis of PEO 4 Achievement

a) PEO 4: Engaging in Activities to Enhance Knowledge for Successful Career Advancement

Table 4 presents the research findings for Program Educational Objective (PEO) 4, which focuses on graduates' engagement in activities aimed at advancing their careers. These activities include pursuing further education to higher levels such as advanced diplomas, degrees, masters, or PhDs, updating knowledge to adapt to technological advancements, and obtaining professional certifications. Career advancement entails securing senior positions like senior technicians, project managers, consultants, or supervisors.

Table 4. Research findings for PEO 4

Instrument	Number of Respondents (*n*)
Item 1: Have you engaged any courses/ activities to upgrade the knowledge and / or adapting to new technologies /new media (e.g.: seminar / webinar / training / short courses / professional certification, etc.)	**(*n* = 26)**
• Yes	19
• No	7
Item 2: What is your achievement thus far?	**(*n* = 26)**
• Salary increment	13
• Promoted to higher post (etc. senior technician/supervisor)	3
• Own business	1

• Further studies		5
Achievement of PEO 4		
	Yes	26
	No	0

Fig. 9 illustrates the outcomes of these engagements, with 59% of respondents experiencing a salary increase, 23% continuing their studies, 14% securing higher-level positions, and 4% starting their own businesses.

Fig. 10 presents the achievement of PEO 4 for the Diploma in Electrical and Electronic Engineering (DEE), indicating that 100% of respondents have fulfilled PEO 4. This includes further education, senior positions, salary increments, involvement in technical projects or research and development, and knowledge enhancement. PEO 4 correlates with Program Learning Outcome (PLO) 12, which acknowledges the importance of independent updating of specialized technical knowledge.

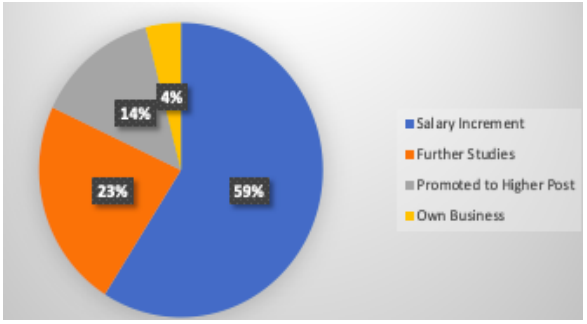

Fig. 9. Achievement for graduate

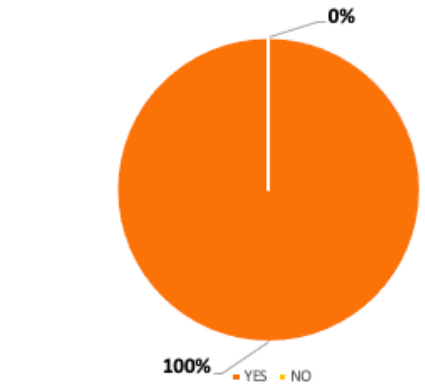

Fig. 10. Achievement of PEO 4

3.6 Analysis of Overall PEO Achievement

Fig. 11 illustrates the overall achievement of the Program Educational Objectives (PEOs). PEO 1 attainment is deemed satisfactory, with 69.23% of respondents working as technicians in electronic and/or electrical engineering fields. Additionally, 15.38% were employed in other sectors, while another 15.38% were either studying or unemployed. PEO 2 achieved an excellent score of 100%, indicating that all respondents demonstrated professional ethics and responsibilities in contributing to society.

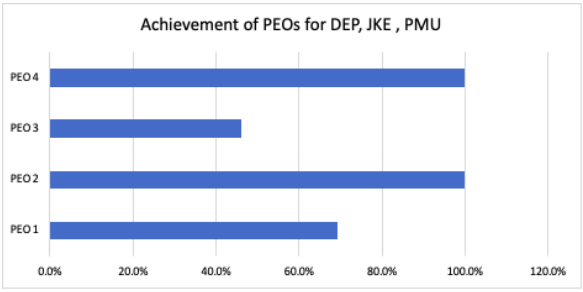

Fig. 11. Achievement for PEOs, DEP

On the other hand, PEO 3 had the lowest achievement rate at 46.15%. While most graduates displayed professional ethics and responsibilities, they showed less involvement in enterprising activities utilizing engineering knowledge and technical skills. Conversely, PEO 4 also attained an excellent score of 100%, signifying that all graduates engaged in activities aimed at enhancing their knowledge for successful career advancement.

4. Conclusion

The analysis of data collected from the DEP, Electrical Engineering Department, Politeknik Mukah, reveals that graduates have effectively met the Program Educational Objectives (PEOs). A significant number of graduates have achieved PEO 1, demonstrating proficiency as practicing technicians in electrical engineering. Furthermore, the study indicates that graduates have contributed positively to society by upholding professional ethics and responsibility, as evidenced by the attainment of PEO 2. Additionally, graduates have actively participated in activities applying technical knowledge and skills, aligning with PEO 3. Moreover, the research highlights graduates' engagement in activities aimed at enhancing their understanding for successful career advancement, reflecting the achievement of PEO 4. Furthermore, the implementation of Outcome-Based Learning (OBE) aligns with the program objectives set by the Department of Polytechnic Education and Community Colleges (JPPKK), under the Ministry of Higher Education Malaysia (MOE). OBE ensures that academic programs, teaching methods, assessments, and graduate outcomes meet high-quality standards. It mandates that students demonstrate proficiency in achieving learning outcomes across curriculum, teaching and learning, assessment, and Continuous Quality Improvement (CQI). Overall, this study serves to enhance the quality of education and training

at Malaysian Polytechnics and informs future planning for polytechnic study programs.

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