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Implementation of Outcome Based Education toward ETAC accreditation in Diploma in Electrical Engineering (Electronic)

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ABSTRACT

Outcome-Based Education (OBE) has been widely implemented in Malaysia's tertiary education system as part of initiatives to improve the quality and relevance of the curriculum approach. The Engineering Technology Accreditation Council (ETAC) accreditation is an essential criterion for assuring program quality and linking curricular outcomes with industry demands and standards. The issue is that there is not a dependable and systematic framework for evaluating and assessing these 12 Program Outcomes (PO) attainment in a way that meets accreditation and educational requirements. Additionally, curriculum design, instructional strategies, and evaluations need to be better aligned with the changing needs of the industry's evolving demands. In this study, we examine the implementation and evaluation of an OBE model that is adapted to the specific requirements of the Diploma in Electrical Engineering (Electronic) (CEEE111). The main objective of this paper is to investigate the successful implementation of OBE as a strategic framework for measuring, monitoring, and evaluating the POs' attainment for ETAC accreditation purposes. In this paper, the overall level of attainment of the POs Average and POs Density of the Diploma in Electrical Engineering (Electronic) program in Electrical Engineering Studies, College of Engineering in UiTM Pasir Gudang (PKE UiTMPG) was analyzed and conducted by OBE-ANAs v15.0 tool. The findings of this study demonstrate that successful OBE implementation plays a pivotal role in assisting programs to attain ETAC accreditation and providing structured strategies for ensuring that curriculum design, teaching techniques, and assessment align with these accrediting standards.

Keywords: Outcome based education; program outcomes; ETAC; engineering education; OBE-ANAS

INTRODUCTION

Outcomes-Based Education (OBE) is crucial for enhancing the curriculum system. The priority is to concentrate on achieving outcomes. Note that OBE establishes clear expectations for the best outcomes. Students comprehend their expectations, while teachers grasp what they must demonstrate during the course (Mohamed et al. 2019). Clarity is essential for learners to progress effectively in all categories and levels by clearly describing the required data and skills (Poongodi 2020). This also includes pliability. Moreover, teachers have the flexibility to tailor their classes to meet students' preferences by clearly understanding what needs to be accomplished (Victor et al. 2022). Hence, OBE does not prescribe a specific instructional methodology. Instead, it grants teachers the freedom to employ any suiTable approach.

Furthermore, in OBE, educators can recognize the diversity among students by employing various teaching and assessment techniques, as it is a student-centered learning model. Instructors will facilitate students in grasping concepts through various means, such as study guides, group work, and seminars, all aimed at enhancing student learning (Ragupathy et al. 2023). Thus, conducting an analysis is crucial for achieving OBE outcomes. Accordingly, OBE instructors will analyze a student's results to identify areas of improvement, assess talent, and offer personalized guidance to meet their needs. This benefits educators and educational institutions. They assist teachers in tracking the progress and improvement of students over a specific period and aiding them in attaining their goals. (Arun Kumar, 2020). Other than that, student involvement in an institution is a crucial element of OBE. Hence, students should strive to independently master the material to ensure full comprehension. Increased student involvement allows students to take responsibility for their learning and enables them to learn significantly through independent study (Yusof et al. 2021).

Program Outcomes (POs) are the skills and characteristics that all graduates are expected to attain when they complete their studies. The study plan for the CEEE111 program aligns with 12 POs developed according to the Engineering Technology Accreditation Council (ETAC) generic POs. The CEEE111 program has undergone multiple curriculum reviews to meet the standards set by regulatory bodies such as the Malaysian Qualification Agency (MQA), ETAC, and the Ministry of Higher Education (MoHE). During the curriculum review process, factors including program structure, credit hours, syllabus content, course prerequisites, industrial technology, current software, Student Learning Time (SLT), OBE, and other elements are considered as they significantly impact the curriculum. The POs for the CEEE111 program, displayed in Table 1, are crafted to develop advanced skills and knowledge for each Electrical Engineering graduate, meeting the demands of the industry. Remarkably, the top management council thoroughly evaluated all specified POs with input from stakeholders, including industries, employers, alumni, and parents.

The process of implementing OBE involves several key components, starting with the establishment of Program Educational Objectives (PEOs), followed by the definition of PO curriculum development, teaching and learning methods, assessment strategies, Continuous Quality Improvement (CQI), and ongoing monitoring. In particular, PEOs are developed in alignment with the institution's mission statement and reflect the interests of various stakeholders, including industry partners, faculty, and students. These objectives typically focus on the post-graduation achievements of graduates within three to five years. POs, conversely, define the specific skills, knowledge, and attributes that students must attain by the time they graduate. In addition, POs are derived from the PEOs and serve as a measurable framework for ensuring that graduates meet the necessary competencies for professional practice in PEOs (Sumathi et al. 2023; Kumar et al. 2021). Notably, POs specify the knowledge, skills, and attributes students are expected to achieve.

Despite the benefits of OBE, its implementation presents several challenges. One of the main issues lies in the interpretation of the framework itself. While OBE clearly outlines the desired outcomes for students, it lacks a standardized set of instructional design guidelines, leaving room for varying interpretations across different programs and institutions. This flexibility can result in discrepancies in how the framework is applied, potentially impacting the consistency and effectiveness of curriculum delivery (Sharma & Dwivedi, 2020). Furthermore, the abundance of technical terminology can lead to becoming engrossed in the jargon rather than concentrating on the underlying meanings. Consequently, developing learning outcomes can be challenging and time-consuming (Anitha et al. 2023; Sapawi et al. 2023).

Diploma CEEE111 programs at PKE UiTM Pasir Gudang encounter difficulties ensuring comprehensive evaluation across the cognitive, affective, and psychomotor domains, as ETAC's 12 POs mandated. The problem lies in the lack of a reliable and systematic framework for assessing the achievement of these 12 POs in a manner that satisfies educational and accreditation requirements. Thus, it is necessary to better align curriculum design, instructional strategies, and evaluations with the industry's evolving demands (Agrawal et al. 2021; Gates et al. 2024). Moreover, there is minimal evidence-based analysis regarding the efficacy of specific tools, such as OBE-ANAS v15.0, in optimizing the measurement and monitoring of PO attainment.

The research objectives are clearly defined, aiming to assess the alignment of the CEEE111 program's POs with industry standards, evaluate the effectiveness of the OBE model in measuring student attainment, identify strengths and areas for improvement, and propose recommendations for CQI. The research questions further guide the study, focusing on the effectiveness of OBE implementation, the relationship between course and POs, and areas requiring improvement, particularly with respect to PO3 (Design and Develop Solutions). Additionally, the significance of the study has been emphasized, noting its contribution to improving program quality, enhancing student learning outcomes, and ensuring the program remains relevant to industry needs. Therefore, by addressing these key aspects, this revision aims to provide a clear and focused foundation for the study, ensuring its relevance to academic and industry expectations.

TABLE 1. PO statements for the CEEE111 program

Program Outcomes	
PO1 (Knowledge)	Apply knowledge of applied mathematics, applied science, engineering fundamentals, and an engineering specialization as specified in DK1 to DK4, respectively, to wide practical procedures and practices.
PO2 (Problem Analysis)	Identify and analyze well-defined engineering problems, reaching substantiated conclusions using codified analysis methods specific to their field of activity (DK1 to DK4).
PO3 (Design/ Development of Solutions)	Design solutions for well-defined technical problems and assist with the design of systems, components, or processes to meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations (DK5).
PO4 (Investigation)	Conduct investigations of well-defined problems; locate and search relevant codes and catalogs; conduct standard tests and measurements.
PO5 (Modern Tool Usage)	Apply appropriate techniques, resources, and modern engineering and IT tools to well-defined engineering problems, with an awareness of the limitations (DK6).
PO6 (Engineering & Society)	Demonstrate knowledge of the societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to engineering technician practice and solutions to well-defined engineering problems (DK7).
PO7 (Environment & Sustainability)	Understand and evaluate the sustainability and impact of engineering technician work in the solution of well-defined engineering problems in societal and environmental contexts (DK7).
PO8 (Ethics)	Understand and commit to professional ethics, responsibilities, and norms of technician practice (DK7).
PO9 (Individual and Teamwork)	Function effectively as an individual and as a member of diverse technical teams.
PO10 (Communications)	Communicate effectively on well-defined engineering activities with the engineering community and with society at large by comprehending the work of others, documenting their work, and giving and receiving clear instructions.
PO11 (Project Management & Finance)	Demonstrate knowledge and understanding of engineering management principles and apply these to one's work as a member or leader in a technical team and to manage projects in multidisciplinary environments.
PO12 (Life-long Learning)	Recognize the need for and have the ability to engage in independent updating in the context of specialized technical knowledge.

METHODOLOGY

METHODS IN MEASURING PROGRAM PERFORMANCE FOR OBE EVALUATION

Since 2005, OBE has mostly been used in Malaysia's Public Higher Education Institutions (IPTAs) to ensure that the academic program, delivery system, and evaluation techniques result in graduates with high-quality knowledge and skills. The Quality Assurance Department at MoHE, also known as the MQA, drives the paradigm shift to OBE in Malaysia (Mohamad et al. 2012). Moreover, to satisfy the demands of the Engineering Accreditation Council (EAC) for degree programs and ETAC for diploma programs, undergraduate curricula must satisfy the OBE requirement by the council. Measurement in OBE typically involves assessing student performance against specific learning outcomes or competencies. Therefore, various methods are employed to measure OBE, as illustrated in Figure 1.

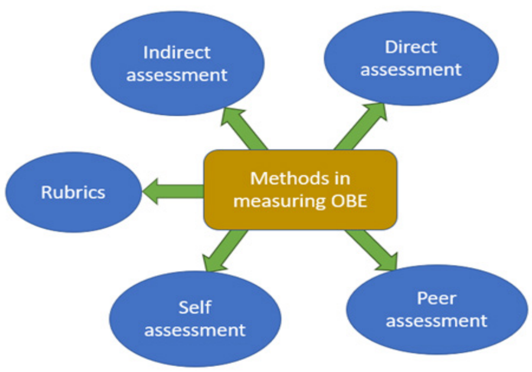

FIGURE 1. Types of methods for measuring OBE

In OBE, assessment is an ongoing process integrated into the learning experience. The goal of assessment is to evaluate student learning, provide feedback, and guide future instruction. Furthermore, assessment plays a crucial role in the implementation of OBE. The attainment of OBE can be ascertained with the aid of POs, Course Outcomes (COs), and PEOs. It is essential to map COs with POs to evaluate each student's academic performance. The significance of assessing CO in OBE practice is that it provides information on POs and aids in identifying and improving the weaker students (Vinay et al. 2017;Premalatha, 2019;Kumar et al. 2021).

The implementation of OBE in the Diploma in Electrical Engineering programs (CEEE111 and CEEE112) at PKE UiTM follows a systematic, multi-layered approach to assess POs and COs. The process begins with carefully mapping COs to POs to ensure that Course-Level objectives are aligned with the broader program goals. This alignment guarantees that each course contributes to the overall competencies that the program is designed to achieve. Once the COs are mapped to POs, the next step involves assessing student performance through well-defined evaluation tools integrated into the curriculum at various stages of the program (Vanjale et al. 2015).

To simplify the data collection and analysis process, the OBE-ANAS system, a tool developed by PKE UiTM Pulau Pinang, is utilized to input and process student performance data. Figure 2 displays the interface of the OBE-ANAS system. This system is designed to oversee the complex task of evaluating and tracking the attainment of COs and POs for each course. Student performance is recorded by the Lecturers in Charge (LICs), who input the data into a standardized template called the CO-PO eRES Excel sheet. This template provides a clear, consistent method for calculating the attainment of COs and POs. It ensures that student scores are accurately represented and easily accessible for analysis.

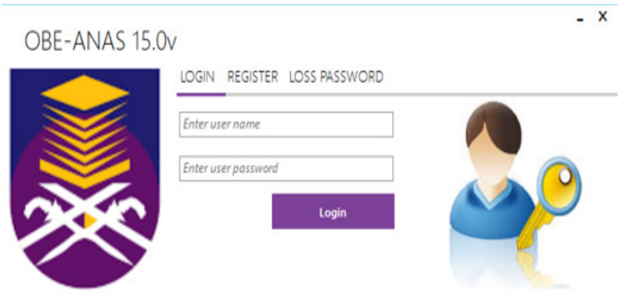

FIGURE 2. The interface of the OBE-ANAS 15.0v system

The OBE-ANAS system then calculates two key metrics for evaluating POs: PO Average and PO Density. PO Average represents the mean attainment of a specific PO across all students and courses, providing a quantitative measure of how well the students are meeting the expected Program-Level outcomes. On the other hand, PO Density calculates the percentage of students whose performance meets or exceeds the threshold of 50% for a given PO. This indicates the number of students passing the expected POs. These metrics are critical in determining whether the program meets the desired outcomes and whether any adjustments need to be made to the curriculum or teaching methods.

These attainment metrics are then compared against pre-established Key Performance Indicators (KPIs) to evaluate the program's success. Notably, the KPI for CO attainment is set at 65%, while for both PO attainment (average and density), the target is 50%. This is to ensure that a significant majority of students are meeting the minimum performance standards. If the results fall below these established thresholds, corrective actions are implemented. The LICs are responsible for identifying the root causes of any underperformance and taking steps to improve teaching and learning strategies. These actions may include revising course content, modifying assessment techniques, providing additional academic support for struggling students, or adjusting the alignment of COs to POs.

Furthermore, the CQI process at PKE UiTMPG is implemented at three distinct levels: Course Level, Program Level, and Student Level, as illustrated in Figure 3. At the Course Level, the focus is on improving the course delivery, content, and assessment methods to ensure that learning objectives are effectively met. Meanwhile, at the Program Level, efforts are made to ensure that the courses are aligned and integrated with the program's overall goals and that the curriculum is structured to support the achievement of all POs. At the same time, the Student Level involves closely monitoring individual student performance, identifying those struggling, and providing targeted interventions to help them improve their outcomes. Accordingly, this comprehensive CQI framework ensures that all aspects of the program are continually assessed and refined to meet accreditation standards and provide students with a high-quality learning experience (Othman et al. 2022).

Hence, this methodology provides a robust and data-driven approach to measuring and improving the performance of the CEEE111 program at PKE UiTMPG. Utilizing the OBE-ANAS system to track and assess CO and PO attainment and implementing CQI practices at multiple levels, PKE UiTMPG ensures that the programs meet the expectations of accreditation bodies and students while continuously enhancing the quality of education.

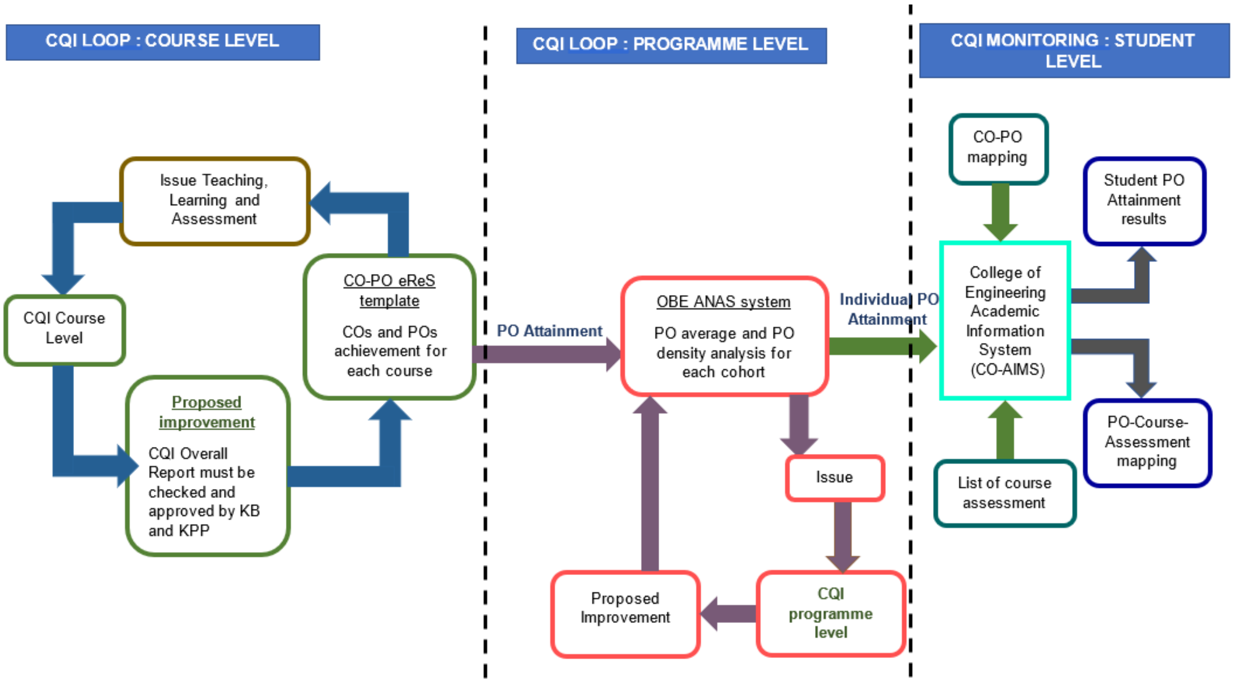

FIGURE 3. CQI process and monitoring in PKE UiTMPG

RESULTS AND DISCUSSION

The POs' performance for the CEEE111 program was evaluated in two major stages: at the Course Level through COs and the Program Level through POs. The relationship between COs and POs allows for the measurement of POs, with two primary methods used for this evaluation: PO Average and PO Density. PO Average measures the overall performance across semesters, from 1 to 6, providing a quantitative value that reflects the cumulative achievement of each PO. On the other hand, PO Density indicates the percentage of students whose performance meets or exceeds the minimum required score (typically 50%). This distinguishes between those who pass and those who fail.

The OBE-ANAS system was employed to collect and analyze performance data, helping to track the POs' attainment through both PO Average and PO Density.

In CEEE111, the KPI used to track program performance is monitored at three levels: ML1, ML2, and ML3. Table 3 outlines the monitoring levels for both PO Average and PO Density. The KPI targets for PO performance at the Course Level were set at 65%, while at the Program Level, a 50% KPI target for PO Average was established. Additionally, the KPI target for PO Density was set at 75%, as summarized in Table 4. These targets serve as benchmarks for determining the program's success in achieving its educational outcomes..

TABLE 3 Monitoring level for PO Average and PO Density

PO Average		PO Density	
PO Score (%)	Monitoring Level	PO Score (%)	Monitoring Level
0-49	ML1	0-49	ML1
50-64	ML2	50-74	ML2
65-100	ML3	75-100	ML3

TABLE 4 Key Performance Indicator for PO at the Course Level, Program Level, and PO Density

Category	PO (Course Level)	PO (Program Level)	PO Density
Compliance	> 65%	> 50%	> 75%
Non- Compliance	< 65%	< 50%	< 75%

The method for calculating both CO and PO attainment is similar, relying on student performance data from assignments, tests, and exams. For instance, Table 5 provides an example from Course EEEXXX assessment weightage, where students' performance in specific assessments contributes to the calculation of PO2. In this case, test and final exam questions totaling 40% contribute to PO2's attainment. Once the students' scores are collected, the next step is calculating the PO Average by tabulating each student's PO score and averaging it for the entire batch (e.g., PO2) as tabulated in Table 6. Table 7 demonstrates this process for PO2 in a sample batch of ten students across three courses.

TABLE 5. Example of Course EEEXXX assessment weightage addressing PO2

Assessment	Test 2			Final Exam		
Question (Q)	Q1	Q2	Q3	Q3 (a,b)	Q4 (a, b, c)	Q5 (a,b)
Full marks	10	10	10	24	26	10
Weightage	10%			30%		

TABLE 6. Example of PO2 Attainment for course code EEEXXX

Student Name	Test 2 Q1	Test 2 Q2	Test 2 Q3	Test 2 Total	Final Exam Q3 (a,b)	Final Exam Q4 (a, b, c)	Final Exam Q5 (a,b)	Final Exam Total	PO2 attainment by each student (%)	
	Score									
Full marks	10	10	10	10%	24	26	10	30%	40	100
Student 1	7	9	9	8.33	14.5	12	5.5	16	24.33	60.83
Student 2	8	7	7.5	7.5	17.5	16.5	8.5	21.25	28.75	71.88
Student 3	8	7	7.5	7.5	18	15	9	21	28.50	71.25
Student 4	5	7	4.5	5.5	17.5	14	5.5	18.5	24.00	60.00
Student 5	5.5	7.5	5.5	6.17	16.5	18	5	19.75	25.92	64.80
Student 6	10	10	9	9.67	21	8	7	18	27.67	69.18
Student 7	10	8	5.5	7.83	20	9.5	5.5	17.5	25.33	63.33
Student 8	10	7.5	5	7.5	21.5	15	8	22.25	29.75	74.38
Student 9	5.5	7	3.5	5.33	12.5	6	10	14.25	19.58	48.95
Student 10	8	6.5	8	7.5	18	18	7	21.5	29.00	72.50

The PO2 attainment by Student 2 is calculated as below

$$PO2 = \left[\frac{(8+7+7.5)}{30} x\ 10\% + \frac{(17.5+16.5+8.5)}{(24+26+10)} x\ 30\%\right] x\ 100\% = 71.88\%. \quad (1)$$

The above calculation is then applied to each student who enrolled for the course code EEEXXX. Consequently, the total average of PO2 attainment for the Course code EEEXXX is calculated as

$$EEEXXX_{PO2} = \frac{\sum(PO2\ marks\ for\ each\ student)}{N_s}, = \frac{(60.83 + 71.88 + 71.25 + 60 + 64.80 + 69.18 + 63.33 + 74.38 + 48.95 + 72.50)}{10}. = 65.71\% \quad (2)$$

TABLE 7. Calculation example for PO Average (Batch = 1, PO2)

Student Name	Student ID	Batch	Course EEE231 (PO2)	Course ECM241 (PO2)	Course ELE232 (PO2)	Average PO Score (%)	Average PO Score ≥ 50%
Name 1	Student ID_1	1	78.00	78.60	71.00	75.87	
Name 2	Student ID_2	1	70.00	78.60	92.00	80.20	
Name 3	Student ID_3	1	64.00	60.00	67.00	63.67	
Name 4	Student ID_4	1	71.00	80.00	60.00	70.33	
Name 5	Student ID_5	1	81.00	60.00	68.00	69.67	
Name 6	Student ID_6	1	97.00	87.17	93.00	92.39	
Name 7	Student ID_7	1	63.00	84.30	83.00	76.77	
Name 8	Student ID_8	1	81.00	91.47	90.00	87.49	
Name 9	Student ID_9	1	50.00	47.17	49.00	48.72	x
Name 10	Student ID_10	1	89.00	78.60	84.00	83.87	
$N_s = 10$							$S_{\geq 50} = 9$

Assume the total number of students for the first batch is ten (10) and only three (3) courses taken, including EEE231, ECM241, and ELE232, that address PO2.

$$PO2\ Average = \frac{\sum(PO2\ marks\ for\ each\ student)}{N_s},$$
$$= \frac{(75.87\% + 80.2\% + 63.67\% + 70.33\% + 69.67\% + 92.39\% + 76.77\% + 87.49\% + 48.72\% + 83.87\%)}{10}.$$
$$= 74.90\% \quad (3)$$

The second type of PO measurement at the Program Level is for the density of PO attainments (PO Density). Note that the PO Density calculation involves two steps. The first step is to tabulate the average PO score by students on the selected batch for the evaluated PO (for example, PO2). The second step is to count the number of students whose average PO attainments are equal to or exceed 50 marks. Based on the data, TABLE 3.5 provides the PO Density score.

$$Number\ of\ student \geq 50\%(S_{\geq 50}) = 9,$$
$$Total\ number\ of\ students, N_s = 10,$$
$$PO2\ Density = \frac{S_{\geq 50}}{N_s} x\ 100\%,$$
$$= \frac{9}{10} x\ 100\%,$$
$$= 90\%. \quad (4)$$

Figure 4 depicts the average PO attainment (%) at the Program Level for the CEEE111 October 2020 cohort. The PO Average and PO Density results reveal positive outcomes for the CEEE111 program's October 2020 cohort. The average PO attainment for all POs (PO1 to PO12) met the KPI target of 50% at the Program Level, indicating that most students achieved the expected level of competence in line with the program's goals. Specifically, the PO Average for all POs surpassed the 50% threshold, demonstrating that students have met the required learning outcomes overall. However, POs 1, 2, 3, and 7 were identified as areas for focused improvement, as their performance fell below the higher monitoring level (ML3) target. These POs are particularly important since they represent foundational competencies critical to the program's success and the future employability of graduates.

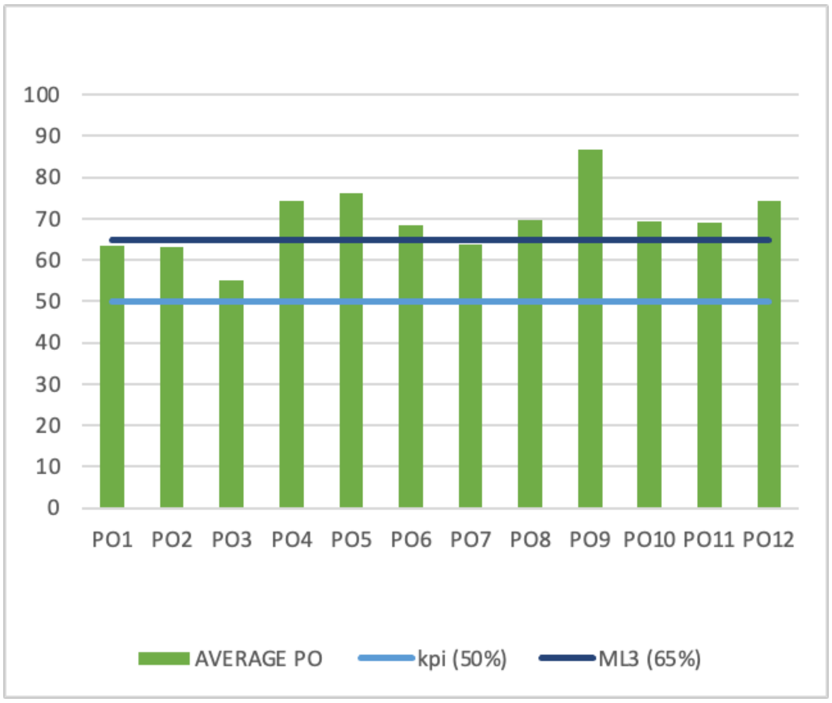

Figure 4. Average PO attainment (%) at Program Level for CEEE111 October 2020 cohort

In terms of PO Density, the KPI target for this metric was set at 75%, indicating that 75% or more of students should demonstrate sufficient mastery of each PO (i.e., scoring at least 50%). As displayed in Figure 5, all POs (PO1 to PO12) except PO3 achieved this target, indicating that most students in the cohort met the minimum passing standard for most POs. However, PO3's performance was notably lower than the expected KPI, which aligns with the findings from the PO Average analysis. This suggests that while students in the cohort generally demonstrated proficiency in most areas, there may be challenges in developing specific skills related to PO3. This focuses on designing and developing solutions to complex engineering problems.

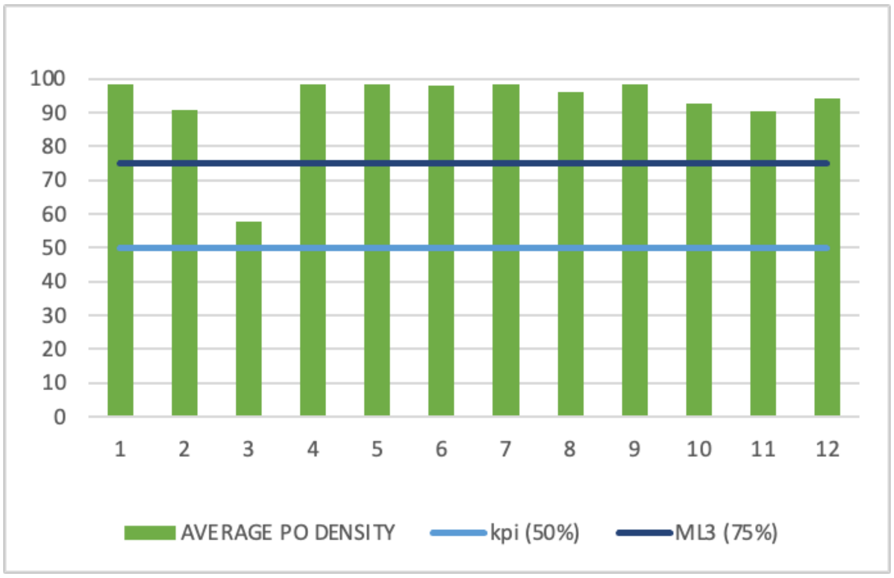

FIGURE 5. Average PO Density (%) at Program Level for CEEE111 October 2020 cohort

Overall, the analysis of the October 2020 cohort revealed that all POs (PO1 to PO12) achieved the KPI target for average attainment, except for PO1, PO2, PO3, and PO7, which were below the ML3. Similarly, the PO Density results indicated that all POs, except PO3, met the KPI target. PO3's lower performance reflects challenges in students' ability to design and develop solutions, a key competency under this outcome. Further analysis across cohorts revealed consistent issues with PO3, likely due to misaligned assessments, insufficient teaching strategies, and a lack of practical exposure to design-related tasks. To address these gaps, it is recommended that assessments and teaching strategies be improved to enhance the alignment with PO3, supported by additional workshops and project-based learning. Overall, the CEEE111 program demonstrated excellent achievement for the October 2020 cohort, with CQI measures focusing on PO3 to sustain and enhance POs.

For instance, comparative analysis across different cohorts could reveal whether this issue persists over time or is cohort-specific. Such analysis might also highlight trends or patterns related to assessment alignment, curriculum structure, or teaching strategies. Additionally, a closer examination of the courses mapped to PO3 could help identify gaps in content delivery, practical exposure, or the design of assessments. For instance, if PO3 emphasizes skills in "design and development of solutions," the lack of hands-on projects or opportunities to apply theoretical knowledge in real-world contexts could be contributing factors. Therefore, incorporating student and faculty feedback through surveys or interviews would add depth to this analysis, enabling a more comprehensive understanding of the challenges and identifying opportunities for improvement.

The program's success in meeting the KPI targets for PO Average and PO Density indicates a strong foundation. However, the ongoing development of course materials and teaching strategies will be necessary to address the identified gaps, particularly in PO3. Hence, further investigation and adjustments in the curriculum related to problem-solving and solution development can be implemented to ensure that future cohorts achieve higher performance in this area. This further strengthens the CEEE111 program's overall quality and alignment with industry standards.

This investigation would enhance the current findings and add a valuable research dimension to the study. It would provide evidence-based recommendations for CQI, particularly for PO3, ensuring better alignment with ETAC standards and reinforcing the program's commitment to excellence in OBE.

CONCLUSION

This study demonstrated the importance of OBE implementation in the context of engineering education in Malaysia, especially in attaining accreditation from the ETAC. Notably, OBE has become a fundamental approach for improving engineering educational programs' quality, relevance, and effectiveness. This study focused on the Diploma in Electrical Engineering (Electronic) (CEEE111) program, exploring the successful implementation of OBE as a strategic framework for measuring, monitoring, and evaluating the achievement of all 12 POs required for ETAC accreditation.

This study demonstrated that OBE has provided a structured approach to curriculum design and assessment practices by analyzing the POs' Average and POs' Density using the OBE-ANAS v14.0 tool. The findings highlight that OBE's three-domain evaluation: knowledge (cognitive), behavior (affective), and skills (psychomotor) have facilitated a complete assessment of POs, aligning them with the ETAC accreditation and engineering profession's expectations. Furthermore, OBE promotes the collection and analysis of data on student achievement. This data can provide significant insights into PO areas where students succeed and areas where they may require further assistance.

Nevertheless, by fostering continuous PO monitoring and quality improvement, OBE implementation can ensure that engineering graduates are well-prepared for the dynamic challenges of the engineering sector. Moreover, this study emphasizes the significance of OBE in promoting engineering education and facilitating program excellence and relevance in compliance with ETAC accreditation standards.

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DECLARATION OF COMPETING INTEREST

None.

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