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Correlation Between Students' Entrance Exit Survey Results and their Program Outcome (PO) Scores

Rohaiza Baharudin*, Asmalia Zanal, Anis Diyana Rosli, Mohd Hussaini Abbas, Ida Rahayu Mohamed Noordin, Juliana Md Sharif
Faculty of Electrical Engineering, Universiti Teknologi MARA Cawangan Pulau Pinang, Permatang Pauh Campus, 13500 Seberang Prai, Pulau Pinang, Malaysia

*Corresponding author: rohaiza684@uitm.edu.my

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Abstract

This study explores the correlation between students' Entrance-Exit Survey (EES) results and Programme Outcome (PO) scores in the Electrical Measurement course at Universiti Teknologi MARA (UiTM). Conducted over four semesters with 184 diploma students in Electrical Engineering, the study utilized a five-point Likert scale to assess students' self-rated understanding and mastery of course outcomes. The EES, administered via the UFUTURE platform, supports Outcome-Based Education (OBE) by capturing learning progress from course entry to completion. Survey data and continuous assessments were mapped to the Course Outcome – Programme Outcome (CO–PO) matrix and analyzed using Jamovi statistical software. The findings indicate a positive correlation between students' survey responses and their PO scores, suggesting that the EES is a reliable tool for evaluating teaching effectiveness and student achievement. This correlation reinforces the value of integrating digital feedback systems into engineering education to enhance curriculum alignment and graduate readiness in response to Industry 4.0 demands.

Keywords: *Programme Outcome Assessment, Entrance-Exit Survey (EES), Outcome-Based Education (OBE), Student Learning Analytics*

INTRODUCTION

Nowadays, the demand for high-quality education and industry-ready graduates has become a primary focus of universities. With rapid technological advancements driven by the Industrial Revolution 4.0, expectations for engineering graduates have reached a new benchmark. Singh and Tilak (2020) emphasize that graduates are now required to possess not only strong technical competencies but also professional readiness that meets employer expectations. To address these evolving industry demands, the Engineering Technology Accreditation Council (ETAC) has developed a comprehensive framework to bridge academic training with real-world industry needs. This initiative aims to enhance the employability and career success of engineering graduates (Hairi et al., 2019; Othman et al., 2025). The framework aligns closely with the principles of Outcome-Based Education (OBE), which focuses on developing and evaluating competencies relevant to professional practice.

Outcome-Based Education (OBE) and Continuous Quality Improvement (CQI) have become widely adopted approaches in higher education to ensure that students achieve clearly defined learning outcomes aligned with program objectives and professional standards (Premalatha, 2019; Wong, 2011). One of the major challenges in implementing OBE lies in the assessment process, particularly in measuring and calculating students' attainment of learning outcomes across multiple courses (Chan et al., 2022; Luzan et al., 2021). Within the OBE framework, Program Outcomes (POs) function as

measurable indicators of the knowledge, skills, and attitudes acquired by students throughout their studies. Continuous assessment of these outcomes is essential for monitoring the effectiveness of teaching and learning processes (Balasubramani & Chiplunkar, 2017; Othman et al., 2024).

Nayak (2019) illustrates how to calculate the attainment of Course Outcomes (CO) based on scores from sessional tests, assignments, and the final semester examination. Bansal et al. (2015) and Lui and Shum (2012) emphasize the application of Outcome-Based Education (OBE) in systematically designing and restructuring curricula, as well as assessing the efficacy of teaching strategies. This research focuses on the assessment approach of the framework as it pertains to engineering college students and discusses the challenges encountered during the implementation of the OBE framework.

Measuring Course Outcomes (CO) and Program Outcomes (PO) involves both direct and indirect assessment methods (Kristianto et al., 2025; Rajak et al., 2019). Direct assessment analyzes student performance through exams, projects, and presentations linked to specific COs, with attainment levels calculated based on the percentage of students meeting a set performance threshold (Dargham et al., 2014; Lavanya & Murthy, 2022).

Indirect assessment, on the other hand, includes surveys such as course exit surveys, alumni and employer feedback, and student self-assessment, which capture perceptions of learning and skill development. Ahmed Ghaly (2020) and Desai et al. (2018) highlight the significance of implementing indirect assessment methods as a complementary approach to evaluate Course Outcomes (CO) and Program Outcomes (PO), providing valuable insights into students' perceptions and the overall effectiveness of the educational process. Combining these approaches provides a comprehensive evaluation, enhancing the reliability of outcome measurement and supporting continuous quality improvement in line with Outcome-Based Education principles.

One of the common indirect assessment methods for measuring Course Outcomes (CO) and Program Outcomes (PO) is the Entrance - Exit Survey (EES). It evaluates students' perceptions of their learning progress (Anuar et al., 2023; Jelai et al., 2025; Ng et al., 2016; Zalela et al., 2024). This survey is designed to measure students' self-assessed improvement across various learning domains cognitive, psychomotor, and affective by comparing their perceptions at the beginning and end of a course. The difference in responses from the entrance and exit surveys, often referred to as the frequency score, indicates the extent of perceived learning gains. However, there can be discrepancies between students' self-assessed progress (as indicated by EES results) and their actual performance, which is reflected in Program Outcome (PO) scores. Understanding the relationship between these two measures is crucial for ensuring the reliability of self-assessment tools and for improving strategies for student learning and evaluation (A Mizue., 2018; Ayob, 2011; Chandna., 2015).

At the faculty, the Entrance - Exit Survey (EES) has not yet been utilized as a formal assessment instrument for evaluating student performance in accordance with Outcome-Based Education (OBE) requirements for Engineering Technology Accreditation Council (ETAC) accreditation. Although a comprehensive database is available and students are encouraged to complete the survey via the UFUTURE platform for each course, the EES has not been systematically integrated into the program's assessment framework for measuring Program Outcome (PO) attainment. Therefore, this study aims to analyze the correlation between students' Entrance–Exit Survey results and their Program Outcome (PO) achievement scores. The findings are expected to provide empirical evidence on the extent to which students' self-assessed learning outcomes reflect actual PO attainment, thereby supporting continuous quality improvement (CQI) processes and informing more reliable and effective OBE-aligned assessment practices for future ETAC accreditation cycles.

METHODS

1. Electrical Measurement Course

The Electrical Measurement course is designed to provide students with a comprehensive understanding of measurement principles and instrumentation techniques essential in electrical and electronic engineering. This course is a core subject for students in the Diploma in Electrical and Electronic Engineering program at Universiti Teknologi MARA (UiTM) and is offered in Year 1 Semester 2. The

curriculum for this course covers topic related to electrical measurement, such as measurement quality, DC and AC meters, oscilloscopes, DC and AC bridges, and transducers. The course aims to improve students' proficiency in using measurement tools, analysing data, and applying suitable methodologies to real-world engineering problems through theoretical study and practical implementations. Course Outcomes (COs) are statements of objectives to be achieved by students at the end of a semester.

Table 1 presents the alignment between the Course Outcomes (CO) of the subject and the corresponding Program Outcomes (PO) as stipulated by the Engineering Technology Accreditation Council (ETAC). This mapping illustrates how the expected learning at the course level contributes to the broader competencies required at the program level. Both Course Outcomes 1 (CO1) and Course Outcomes 2 (CO2) are classified under the Cognitive domain, emphasizing students' mastery of knowledge, comprehension, and analytical thinking. CO1 focuses on students' ability to discuss basic concepts and methods of analysis related to measuring instruments and transducers. This outcome aligns with Program Outcome 1 (PO1), where students are expected to apply knowledge from applied mathematics, applied science, and engineering fundamentals to practical procedures. Meanwhile, CO2 emphasizes students' ability to apply methods of analysis based on the working principles of instruments and transducers. This outcome corresponds with Program Outcome 2 (PO2), which requires students to identify and analyse well-defined engineering problems using codified analytical methods to arrive at substantiated conclusions.

Table 1 Course outcome vs program outcome (ETAC)

Domain	Course Outcome (CO)	Program Outcome (PO)
Cognitive	**CO1:** Discuss basic concept and method of analysis in measuring instruments and transducers based on their working principles.	**PO1:** Apply knowledge of applied mathematics, applied science, engineering fundamentals and an engineering specialisation to wide practical procedures and practices
Cognitive	**CO2:** Apply method of analysis in measuring instruments and transducers based on their working principles	**PO2:** Identify and analyse well-defined engineering problems reaching substantiated conclusions using codified methods of analysis specific to their field of activity.
Psychomotor	**CO3:** Construct basic measuring circuit using simulation software and/or experimental setup.	**PO4:** Conduct investigations of well-defined problems; locate and search relevant codes and catalogues, conduct standard tests and measurements.

The continuous assessment for this subject comprises 70% cognitive and 30% psychomotor evaluations, as shown in Table 2. Program Outcomes (PO1 and PO2), which focus on the cognitive domain, are assessed through tests and the final examination. Meanwhile, Program Outcome 4 (PO4), which represents the psychomotor domain, is evaluated through laboratory exercises and practical tests.

Table 2 Percentage assessment for cognitive and psychomotor

Domain	Assessments	PO	Percentage
Cognitive	Test 1 & Test 2	PO1 & PO2	20%
Psychomotor	Practical Test	PO4	10%
Psychomotor	Lab Exercise	PO4	20%
Cognitive	Final Examination	PO1 & PO2	50%
TOTAL			100%

1. Entrance - Exit Survey (EES)

The Entrance - Exit Survey System (EES) is a systematic evaluation conducted every semester for all courses. The entrance survey takes place at the beginning of the semester, usually during the first four weeks, to assess students' pre-existing knowledge and preparedness concerning the course they are registered for. Conversely, the exit survey is conducted at the semester's end (during weeks thirteen and fourteen) to evaluate students' understanding after course completion, highlighting any gains or

losses in their level of mastery.

The implementation of Outcome - Based Education (OBE) at Universiti Teknologi MARA (UiTM) is supported by robust digital platforms and tools. One of the key systems facilitating this process is UFUTURE, an online learning management portal accessible to all UiTM users. UFUTURE enables the administration of the Entrance - Exit Survey (EES) and Student Feedback Online (SUFO) at the end of each course Abedin et al. (2014). Students can conveniently complete these surveys through the UFUTURE platform, which is accessible via their iStudent Portal accounts.

The data collected from these surveys are crucial for the Outcome - Based Education (OBE) framework, as they allow educators to assess the effectiveness of teaching and learning methods. By comparing the results of the entrance and exit surveys, valuable insights into students' cognitive growth and academic performance are generated, facilitating ongoing quality enhancements in curriculum development and delivery. Table 3 presents a question from the entrance-exit survey developed by the subject's resource person. These thoughtfully crafted questions correspond to each chapter, ensuring a comprehensive assessment of the material covered.

Table 3 Entrance Exit Survey question

No.	Question	Chapter	PO1 & PO2 (Cognitive)	PO3 (Psychomotor)
1	I can define basic concept of measurement, measurement standards and error in measurement.	1	√	
2	I can apply science and engineering fundamentals in statistical analysis, limiting error and total measurement system error	1	√	
3	I can define basic concept of Permanent Magnet Moving Coil (PMMC)	2	√	
4	I can apply the concept of PMMC used in DC ammeter, voltmeter, ohmmeter, half wave and full wave rectification	2	√	
5	I can apply in-depth knowledge in the loading effects and ammeter insertion effects	2	√	√
6	I can define basic concept of Cathode Ray Oscilloscope (CRO) and Cathode Ray Tube (CRT)	3	√	√
7	I can apply in-depth knowledge in voltage, phase difference & frequency measurement in Lissajous patterns	3	√	√
8	I can define basic concept of principle operation, balance and unbalance condition of bridges Wheatstone	3	√	√
9	I can apply in-depth knowledge in application of dc bridges	4	√	√
10	I can apply in-depth knowledge in interpreting several types of ac bridges	4	√	√
11	I can define basic concept of transducers	5	√	
12	I can apply in-depth knowledge in transducer's application	5	√	√

2. Data Collection

The analysis utilized data from four longitudinal correlational, involving a total of 184 students from two diploma programs, CEE111 and CEE112, who were enrolled in the ESE122 course (Table 4). All students enrolled in the course who answer the EES are come from different cohort. Informed consent was implied, as students voluntarily completed the Entrance - Exit Survey (EES) via the UFUTURE

platform. At the point of survey administration, students were informed that their responses could be used for academic research and continuous quality improvement purposes. The results are based on the Entrance - Exit Survey (EES), which was used to assess the effectiveness of teaching and learning through the student self-rating process. The EES results and course continuous assessment analyses were mapped to the Course Outcomes - Program Outcomes (CO-PO) matrix. The Jamovi statistical software was employed to perform data analysis for this study.

Table 4 Number of students for data analysis

Semester	No. of students
March 2025 - August 2025	77
October 2024 - February 2025	13
March 2024 - August 2024	81
October 2023 - February 2024	14
TOTAL	184

The Entrance - Exit Survey (EES) employs a five-point Likert scale to assess students' perceptions of their understanding and achievement regarding the course outcomes as presented in Table 5. This scale ranges from 1 (Strongly Disagree) to 5 (Strongly Agree), enabling students to evaluate their level of confidence and mastery for each outcome. A score of 1 indicates a very low level of understanding or disagreement with the statement, while a score of 5 shows strong agreement and high confidence. The midpoint of 3 (Mixed Feelings) signifies a neutral stance, suggesting either uncertainty or moderate comprehension. This scale offers a quantitative way to gauge students' learning progress from the beginning to the conclusion of the course.

Table 5 Likert scale for Entrance-Exit Survey

Scale	Description
1	Strongly Disagree
2	Disagree
3	Mixed Feeling
4	Agree
5	Strongly Agree

The frequency score was calculated by subtracting the entrance score from the exit score for each course outcome item. This difference, expressed as:

$$\text{Frequency Score} = \text{Exit Score} - \text{Entrance Score}$$

It reflects the extent of improvement or change in students' self-evaluated comprehension throughout the course. A positive frequency score signifies an increase in students' knowledge or confidence, indicating successful teaching and learning methods. On the other hand, a negative score suggests a reduction in understanding, highlighting areas that may need further instructional enhancement. A score of zero indicates no change in perception or knowledge level. This analysis offers important insights into students' learning development and the overall effectiveness of the course delivery.

3. Statistical Data Analysis

This study employed quantitative statistical analyses to evaluate the reliability of the research instrument and to examine changes and relationships between the Entrance Survey and Exit Survey data. The internal consistency of the questionnaire items was first assessed using Cronbach's alpha, a widely accepted reliability measure in educational research for evaluating the extent to which items consistently measure the same underlying construct. Cronbach's alpha values range from 0 to 1, with higher values indicating stronger internal consistency.

Subsequently, a paired-samples t-test was conducted to determine whether there were

statistically significant differences in students' perceptions before and after course completion. The Entrance Survey was administered at the beginning of the course, while the Exit Survey was administered upon course completion, with responses collected from the same cohort of students. This analysis enabled the evaluation of changes in students' perceptions attributable to their learning experiences throughout the course.

Finally, Pearson correlation analysis was employed to examine the relationship between the Entrance–Exit survey gap scores and Programme Outcomes (PO) performance. The gap scores, calculated as the difference between Exit and Entrance survey scores, represent the magnitude of change in students' perceptions or skills. Pearson correlation was used to assess whether this magnitude of change was linearly associated with students' PO performance. The Pearson correlation coefficient ranges from –1 to +1, with values closer to the extremes indicating stronger linear relationships.

RESULTS AND DISCUSSION

1. Reliability of the EES

The Cronbach's alpha values suggest that the items in the questionnaire are reliable for assessing their corresponding constructs. Entrance survey achieved an alpha of 0.993, which is consistent in measuring students' self-perceived understanding or achievement of course outcomes. Exit survey recorded a Cronbach's alpha of 0.965, indicating excellent internal consistency. These findings support the validity of the gathered data and affirm that the instrument is appropriate for evaluating the intended variables.

Table 6 presents the Cronbach's alpha values obtained for the Entrance and Exit Surveys. The reliability coefficients of 0.993 for the Entrance Survey and 0.965 for the Exit Survey indicate exceptional internal consistency among the survey items. These elevated alpha values imply that the items in the questionnaire are strongly correlated and consistently assess the same construct, specifically the students' self-evaluation of their understanding of the course outcomes. The results demonstrate that both surveys are reliable instruments for evaluating students' perception of their knowledge and skills at the beginning and end of the semester.

Table 6 Reliability analysis of Entrance and Exit Surveys using Cronbach's alpha

Survey Section	Cronbach's alpha
Entrance survey	0.993
Exit Survey	0.965

2. Statistical Analysis of EES and Program Outcomes

Table 7 summarizes the mean scores and standard deviations from the Entrance and Exit Surveys, along with Program Outcomes (PO) in the cognitive and psychomotor domains. The Entrance Survey recorded a mean score of 2.50, signifying that students initially rated their understanding and confidence as moderate. After completing the course, the Exit Survey showed a substantial increase, with a mean score of 4.49, reflecting a notable improvement in perceived learning. The Entrance Survey scores range from 1.00 to 5.00, indicating varying initial confidence levels among students. This wide range suggests that some students possessed limited understanding at the beginning, while others demonstrated moderate to high familiarity with the course content.

In contrast, the Exit Survey scores range from 3.17 to 5.00, suggesting overall improvement in students' self-perceived achievement after completing the course. The findings indicated a statistically significant enhancement in test scores following the intervention ($p < 0.001$), suggesting that the improvement is both meaningful and supported by the data.

For the Program Outcomes, the mean achievement for the Cognitive Domain is 64%, while the Psychomotor Domain shows a higher mean of 84.9%. This indicates that students performed better

in the practical (psychomotor) aspects compared to theoretical understanding (cognitive). The relatively higher standard deviation in the cognitive domain (14.8) suggests a wider variation in students' academic performance, whereas the lower deviation in the psychomotor domain (11.9) indicates more consistent performance in practical tasks.

The frequency score in Table 7 was derived by subtracting Entrance Survey scores from Exit Survey scores, which reflects the extent of improvement in students' perceived learning outcomes. The mean frequency score for the Cognitive Domain stands at 2.03, while the Psychomotor Domain has a slightly lower mean of 1.99. These figures indicate that students experienced significant improvement in both cognitive and psychomotor areas after completing the course. The standard deviations of 1.30 for the Cognitive Domain and 1.29 for the Psychomotor Domain suggest a moderate level of variability among students. This indicates that although most students experienced improvement, the extent of perceived learning gain differed from one individual to another.

Table 7 Descriptive statistics and comparative analysis of Entrance and Exit Survey scores and program outcomes domains

Parameter	Mean	Standard deviation	Minimum	Maximum	p-value
Entrance Survey Score	2.50	1.194	1.00	5.00	<0.001
Exit Survey Score	4.49	0.498	3.17	5.00	
PO Cognitive Domain (%)	64	14.8	15.2	93	
PO Psychomotor Domain (%)	84.9	11.9	8.34	99.2	
Frequency score (Cognitive Domain)	2.03	1.30	-1	4	
Frequency score (Psychomotor Domain)	1.99	1.29	-1	4	

1. Correlation Between EES and Program Outcomes

Figures 1 and 2 present scatter plots illustrating the relationship between the psychomotor and cognitive domains and the frequency score. A weak positive correlation is observed between the frequency score and both domains, indicating that higher improvements in Entrance - Exit Survey scores are slightly associated with better performance in the corresponding Program Outcomes. Although the relationship is weak, the trend suggests a consistent pattern between students' perceived learning gains and their actual performance.

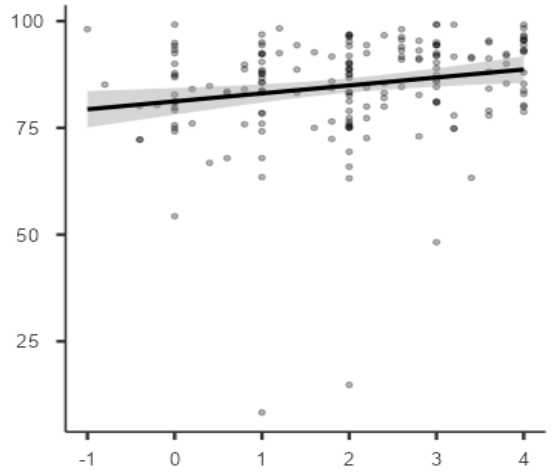

Figure 1 Scatter plot illustrating the correlation between cognitive domain scores and EES frequency scores

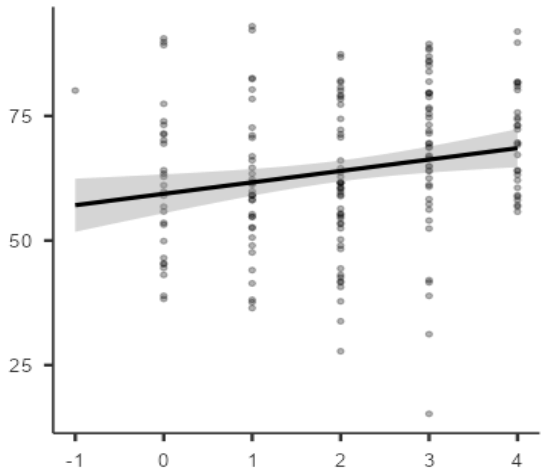

Figure 2 Scatter plot illustrating the correlation between psychomotor domain scores and EES frequency scores

The weak correlation between the frequency score of the Entrance - Exit Survey (EES) and the Programme Outcomes (PO) achievement may be attributed to students' lack of awareness or familiarity with the EES during their first year of study. At this stage in their studies, they might not fully grasp the intended learning outcomes or the significance of the survey items, potentially resulting in inconsistent or less thoughtful responses.

Table 8 displays the correlation between the frequency scores and the Programme Outcomes (POs). The correlation coefficient for PO1 and PO2 (Cognitive Domain) is 0.202, while for PO3 (Psychomotor Domain), it is 0.203. This implies that as students' self-assessed understanding increases, their achievement in both cognitive and psychomotor domains also tend to improve, although the relationship is not strong. Factors such as variations in students' self-perceptions, learning styles, or the differing nature of assessment methods for each domain could contribute to this weak correlation.

Table 8 Pearson correlation analysis between frequency scores and programme outcomes domains

Parameter	Frequency score and PO1, PO2 (Cognitive Domain)	Frequency score and PO3 (Psychomotor Domain)
Pearson's Correlation (r)	0.202	0.203
p-value	0.006	0.006
95% CI Upper	0.337	0.337
95% CI Lower	0.060	0.060
N	185	185

The weak correlation between the frequency scores of the Entrance–Exit Survey (EES) and Programme Outcome (PO) achievement may be attributed to several interrelated factors associated with student self-assessment behaviour, particularly among first-year students. At the early stage of their academic journey, students often have limited exposure to outcome-based education frameworks and may not fully understand the intended learning outcomes or the purpose of the EES items. As a result, their responses may reflect surface-level impressions rather than informed judgments of their actual competencies, leading to variability and inconsistency in self-reported data.

A weak correlation suggests that even though students scored well on the Entrance–Exit Survey (EES), their actual performance, as indicated by the Programme Outcome (PO) scores, did not improve accordingly. This finding indicates that while students may report confidence in achieving course outcomes, such perceptions do not consistently translate into measurable cognitive and psychomotor achievement, as required under the Outcome-Based Education (OBE) and Engineering Technology Accreditation Council (ETAC) framework. From an assessment perspective, this reinforces the limitation of relying on self-reported instruments as standalone indicators of outcome attainment.

To enhance this alignment, it is recommended that a brief orientation session be conducted at the beginning of the semester to clarify the purpose of the EES and its connection to the Programme Outcomes. This approach helps students understand the importance of honestly reflecting on their learning progress. Lecturers should also emphasis the role of EES results in enhancing teaching quality. When students recognise that their feedback is valued, they are more likely to participate genuinely.

Additionally, providing clear feedback and explicitly clarifying how course activities relate to the intended outcomes will help students better assess their own performance. Moreover, aligning assessment rubrics with PO indicators and employing diverse assessment methods will enable more effective measurement of both cognitive and psychomotor skills, thereby fostering stronger alignment between EES responses and PO performance.

Furthermore, the observed perception performance gap provides actionable input for Continuous Quality Improvement (CQI) at the programme level. Specifically, discrepancies between EES results and PO attainment can be systematically reviewed during CQI meetings to inform targeted instructional improvements, refinement of assessment strategies, and enhancement of learning activities addressing both cognitive and psychomotor domains. Overall, this study demonstrates that

integrating indirect (EES) and direct assessment data can strengthen evidence-based decision-making under OBE and ETAC requirements.

CONCLUSION

This study reveals a weak positive correlation between students' self-assessed learning gains, as measured by the Entrance–Exit Survey (EES), and their actual Programme Outcome (PO) attainment. The finding confirms that EES primarily captures students' perceptions rather than objective competency levels, which may be influenced by confidence, assessment experiences, and individual reflection accuracy. Consequently, EES should not be treated as a standalone indicator of outcome attainment under Outcome-Based Education (OBE).

Nevertheless, the results demonstrate the practical value of EES as a complementary indirect assessment tool within the OBE and Engineering Technology Accreditation Council (ETAC) framework. When systematically aligned with PO indicators and assessment rubrics, EES data can provide early diagnostic insight into students' perceived learning and support triangulation with direct assessment evidence. Importantly, discrepancies between EES responses and PO performance can be leveraged within Continuous Quality Improvement (CQI) processes to inform targeted instructional enhancements, assessment refinement, and curriculum improvement at the programme level. Overall, this study highlights the role of integrating indirect and direct assessment data to strengthen evidence-based quality assurance in engineering education.

1. Limitations and Future Work

Despite providing valuable insights into the relationship between students' self-assessed understanding and actual performance, this study has several limitations. First, the Entrance–Exit Survey (EES) relies on self-reported data, which may be influenced by response bias, overconfidence, or underestimation of abilities. As a result, the observed weak positive correlation between EES scores and Programme Outcomes (PO) attainment may not fully reflect students' true competency levels. Second, the study was conducted within a single course and institutional context, which may limit the generalisability of the findings to other programmes, disciplines, or educational settings. Additionally, the analysis focused on aggregate PO performance, potentially overlooking variations at the individual assessment or task level.

Future research should incorporate other self-assessment instruments to better capture students' actual knowledge and skill levels. Longitudinal studies tracking students across multiple courses or academic years could provide deeper insights into the development of cognitive and psychomotor competencies over time. Future work may also explore the integration of learning analytics or automated assessment tools to strengthen the alignment between perceived understanding and measurable learning outcomes.

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DATA AVAILABILITY STATEMENT

Data will be made available on request.

CONFLICT OF INTEREST

There is no conflict of interest regarding the publication of the paper in any journals.

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