

Assessing Learning Environments: A Case Study of Engineering Students' Satisfaction at Diploma Level

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ABSTRACT

The recent trend of diminishing interest in higher education among the youth presents a critical challenge, affecting the future workforce and the nation's ability to innovate and remain competitive. This study examines the factors influencing student engagement and satisfaction in an engineering program at a public university. The study focuses on the relationship between students' academic backgrounds and their perception of the difficulty of university subjects. A comprehensive survey of 39 new engineering students was undertaken in period of six weeks into lectures. The findings indicate that subjects with complex of conceptual understanding, problem-solving requirements, and mathematical applications, like Physics, were considered the most challenging, regardless of students' prior academic achievements. The survey additionally reveals a sense of obligation, especially among female students, rather than a genuine interest in the program. Analysis suggests that prior performance in subjects like Additional Mathematics significantly impacts students' experiences in their current engineering courses. The study concludes with several recommendations to improve student retention and sustain interest in higher education pursuits. These include refining the curriculum, enhancing English language assistance, and implementing specialised initiatives for female students. These recommendations provide actionable insights for educational institutions to enhance student experiences and counter the downward trend in higher education enrolment.

1. INTRODUCTION

A disturbing trend has been observed in Malaysia's higher education scene in recent years specifically in engineering sector. As student enrolment trends shift, understanding the factors that influence satisfaction

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and retention in engineering programs has become increasingly important for higher education institutions. Kementerian Pendidikan Tinggi (2023) reported a discernible decline of 3.8% in diploma graduate students from 2018 to 2022 in the country as indicated in Fig. 1. The downtrend is not only a simple numerical deficit; it is a serious issue that could have a big impact on the country's future academic and economic prospects. The pattern suggests a possible disinterest in higher education, which leads to questions about how desirable this generation finds the current education scheme, and how valuable university programs are viewed to be (Ghom et al., 2023; Yakubu et al., 2023). For Malaysia, a country focused on building a regional hub for education and improving the skills and knowledge of its people to compete worldwide (KPT, 2023), the drop in student applications could be critical. The consequences are especially concerning for the engineering sector, which is essential to the country's ability to innovate and grow. According to Hanapi et al. (2016), engineering disciplines are essential for addressing contemporary issues, such as infrastructure development and technology innovation. Although many studies have explored student satisfaction in higher education, the influencing factors are often unique and depend on the specific institutions and local context. Therefore, it is important to conduct localised studies to understand the specific needs and challenges of students in a particular setting, especially in engineering programs that require strong early engagement and support.

This study aims to evaluate the learning environment at a public institution, specifically focusing on the satisfaction levels of engineering students at the diploma level. The primary objective is to assess student satisfaction with key academic and non-academic aspects, including facilities, teaching methods, and the overall learning process at a public institution in Malaysia. By identifying strengths and areas for improvement, this study seeks to provide insights into factors influencing student retention and engagement in engineering programmes.

2. LITERATURE REVIEW

Engineering education plays a crucial role in supporting a nation's industrial advancement and innovation capacity. With rapid technological changes and the demands of IR4.0, the need for skilled engineering professionals continues to rise globally and in Malaysia. However, recent reports from the Ministry of Higher Education (MOHE) indicate a declining trend in student enrolment in technical and engineering-related programs at the diploma level (KPT, 2023). This trend is concerning as it directly impacts the development of future human capital in STEM fields.

A growing body of research and publications has started to illuminate the complex causes of this concerning pattern. These include teaching methods, the perceived quality of educational facilities, and overall student happiness (Fares & Kachkar, 2013; Mahat & Idrus, 2016). For example, a report by Abd-Razak et al. (2014) and Zen et al. (2014) noted that concerns about campus facilities and educational design programmes contribute to the decline in university applications. Several comparative studies have highlighted differences between local and international universities in terms of student satisfaction and academic experiences. A study conducted in China found that while international students were generally satisfied with teaching quality and learning resources, they expressed concerns regarding English proficiency among instructors and insufficient academic advisory services (Yasmin et al., 2021). Similarly, Thien & Jamil (2020) explored the course experience of undergraduate students in a Malaysian research university, revealing that clear learning goals, effective assessment methods, and faculty interactions played crucial roles in shaping student satisfaction. The 2023 Global Satisfaction Index added that there was a marginal decline in Malaysian university students' satisfaction levels relative to the overall score (Skikne & Baldacchino, 2023).

Most existing research focuses on undergraduate or postgraduate populations, often in Western or highly developed education systems. This creates a gap in understanding how early-stage engineering students in Malaysia perceive their learning environment and what factors may contribute to early disengagement or dropout. This implies that there might be a connection between these factors and student satisfaction with the institution's education programme.

	2018	2019	2020	2021	2022
	341,311 (BW= 14,811; 4.3%)	346,686 (BW= 16,129; 4.7%)	318,593 (BW= 13,292; 4.2%)	333,546 (BW= 15,512; 4.7%)	343,767 (BW= 19,263; 5.6%)
PhD	1.5	1.5	1.4	1.4	1.5
Sarjana	6.7	6.8	6.3	6.9	7.6
Ijazah pertama	40.9	40.2	41.1	42.3	45.1
Diploma	41.2	40.0	40.1	38.7	37.4
Sijil	9.0	10.8	10.4	9.9	7.5
* Peringkat lain	0.6	0.7	0.6	0.9	0.9

Fig. 1. The trend of the overall output of graduates for a five (5) year period by level of study, 2018-2022 (KPT, 2023)

3. METHOD

3.1 Survey Implementation and Analysis Method

The survey was conducted among newly registered students after their initial six weeks at the university, a timeframe deemed sufficient for them to develop preliminary impressions of the learning environment, teaching quality, and available facilities. The survey was administered online via a Google form and the students were informed about the purpose of the survey, and participation was entirely voluntary. The questionnaire consisted of Likert-scale items measuring satisfaction levels across various aspects of the university experience. The collected responses were then compiled and analysed using descriptive statistics to identify trends in satisfaction levels.

This survey aimed to assess five key scopes: the Method of Teaching, Facilities provided in the Faculty, College, Cafeteria, and the overarching Facilities provided. In addition, aside from evaluating educational and infrastructural aspects, the survey also assessed students' interest in continuing their educational journey in the program, capturing their early inclinations towards a long-term commitment to their studies. The reliability of the survey instrument was evaluated using Cronbach's Alpha (Bollen, 2014), which resulted in a score of 0.68. This value indicates a moderate level of internal consistency, suggesting that the survey items are sufficiently related to measure the intended construct.

The survey outcomes were intended to be compared with the respondents' backgrounds to clarify any correlations between demographic factors and satisfaction levels or interest in the program. This comparative analysis aimed to uncover patterns that could signal the influence of specific background characteristics on the 'students' experiences and their subsequent interest in persisting with higher education. The analytical process, leveraging the capabilities of SPSS, included descriptive statistics to summarise data points and inferential statistics to identify significant relationships and differences. As for the validation, the findings were meticulously cross-validated with a distinguished expert in educational methodologies and student engagement from Universiti Teknologi MARA Cawangan Pahang. The resulting insights are expected to focus the factors most influential in shaping the 'students' interest in continuing their academic pursuits at the higher education level.

4. FINDINGS

4.1 Respondents' Background

Error! Reference source not found. illustrates the demographic composition of the participants in this study from one of the Civil Engineering Diploma course of public universities in Malaysia. The gender distribution among the 39 respondents showed a greater number of female participants, with 24 female respondents (61.5%) compared to 15 male respondents (38.5%). In terms of residence, a majority of the respondents, 26 students (66.7%), reported living in urban areas, while the remaining 13 students (33.3%) hailed from rural locales. As for the geographical criteria, the breakdown was as follows: 13 (33.3%)

from Kelantan, 5 (12.8%) from Pahang, 7 (17.9%) from Selangor, and 14 (35.9%) from Terengganu. Regarding the economic backgrounds of the respondents, a significant proportion, 26 students (66.7%), identified as being from the B40 income tier compared to the others.

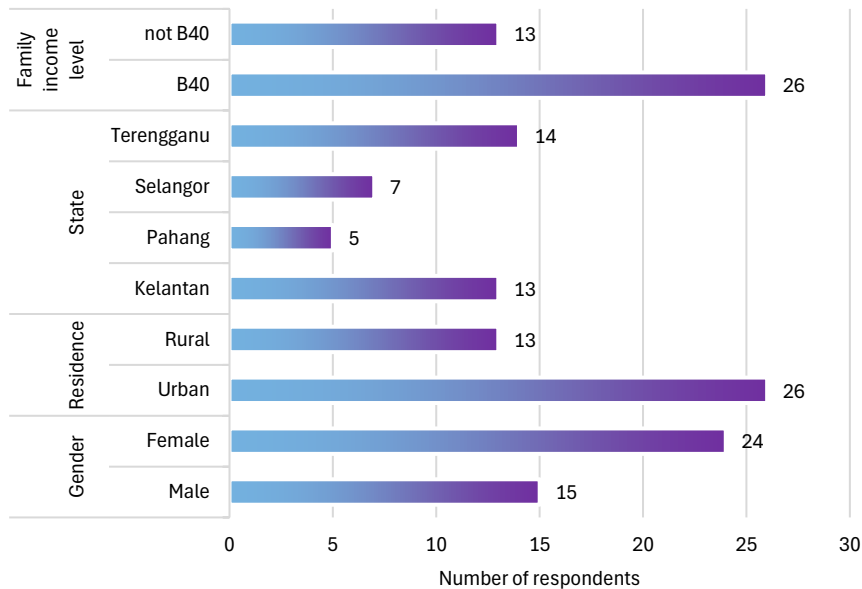


Fig. 2 Distribution of respondents' background

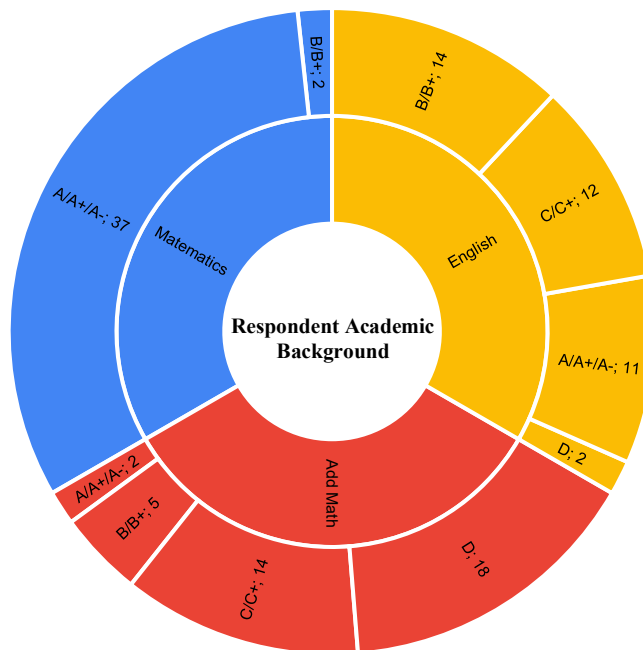


Fig. 3. Secondary school academic background of the respondent sample

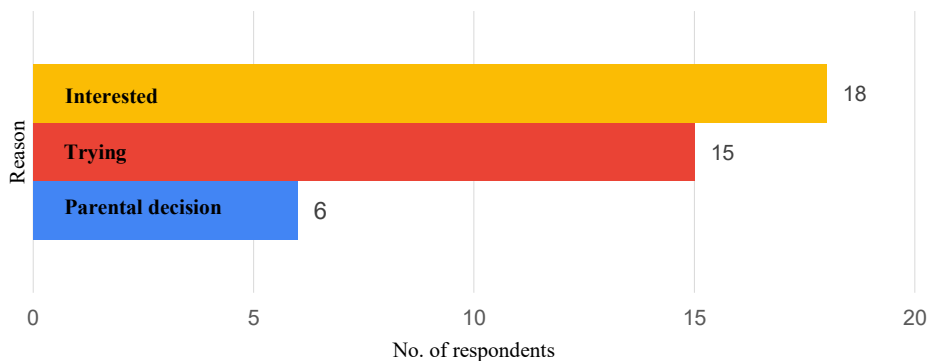


Fig. 4. Reasons for choosing the Engineering Diploma program among respondents

The overview of the respondents' secondary school academic backgrounds is presented in the doughnut chart (Fig. 4). Data for three subjects were recorded: Mathematics, Additional Mathematics, and English. In Mathematics, the majority (37 respondents) attained high grades, earning either A+, A, or A-, indicating strong abilities in this subject. Additional Mathematics presented a broader range of outcomes; two respondents scored A+, A, or A-, five achieved B+ or B, fourteen were graded C+ or C, and eighteen received a D grade. English results were similarly varied: eleven students achieved A+, A, or A- grades, fourteen earned B+ or B, twelve were graded C+ or C, and two received a D grade. In the conducted survey, 18 respondents expressed interest in the Diploma in Engineering program. Moreover, 15 respondents are willing to explore the program, indicating a level of curiosity or openness to the field. Additionally, 6 respondents mentioned that their enrolment in the diploma was due to parental encouragement or decision as shown in Fig. 4.

4.2 Average Satisfaction Scores Analysis

The bar chart in Fig. 5 illustrates the average satisfaction scores for each survey. It aids in interpreting satisfaction levels among respondents across various aspects of the university experience. The mean scores calculated from the Likert scale responses provide a straightforward metric to determine the general sentiment of the student body. "Facilities provided in faculty" specifically refers to resources available within the academic environment, including lecture halls and laboratories, where students engage in classroom learning and practical sessions. "Facilities provided in college" encompasses residential and dining facilities, which are essential for student accommodation and daily living needs. Meanwhile, "facilities provided" in a broader context refers to shared university-wide amenities, including the library, mosque, sports fields, and recreational spaces.

All aspects evaluated in the university experience showed high student satisfaction levels. The 'Facilities provided' survey recorded the highest satisfaction ranking, which climaxes the university's success in creating a conducive overall environment for its students. Conversely, satisfaction with the cafeteria facilities received the least preference. Scores for "Method of teaching," "Facilities provided in Faculty," and "Facilities provided in College" fall between the highest and lowest ranks.

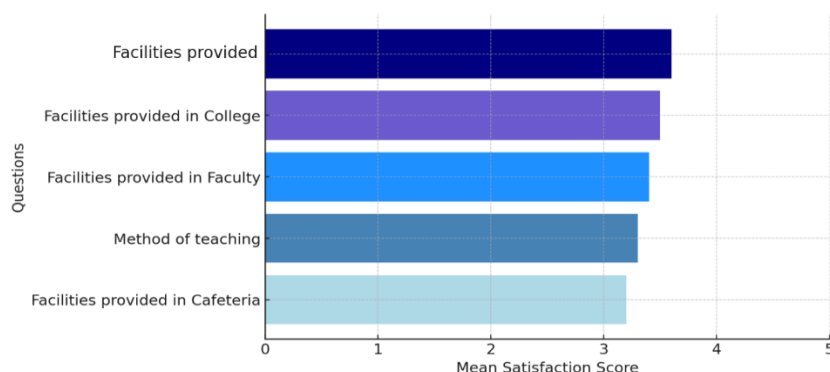


Fig. 5. Average satisfaction scores of each survey

4.3 Correlation between Academic Performance and Perceived Subject Difficulty

In the first semester, new admissions at the engineering faculty are enrolled in a comprehensive curriculum that includes seven subjects. These subjects are a mix of foundational courses and specialised engineering topics (MQA, 2019). Of these, five are service subjects that provide a base in core academic areas, such as calculus and physics, which are essential for a well-rounded understanding of the engineering field. The remaining two are basic engineering subjects designed to introduce students to the discipline's specific concepts and practices. After six weeks of lectures, students were surveyed to identify the subjects they found most challenging. Four subjects were consistently stressed as the most difficult: Physics, Calculus (C), Introduction to Engineering (ICE), and Engineering Drawing (ED). The graph in **Fig. 6** reveals the respondent selection distribution of these subjects based on student feedback.

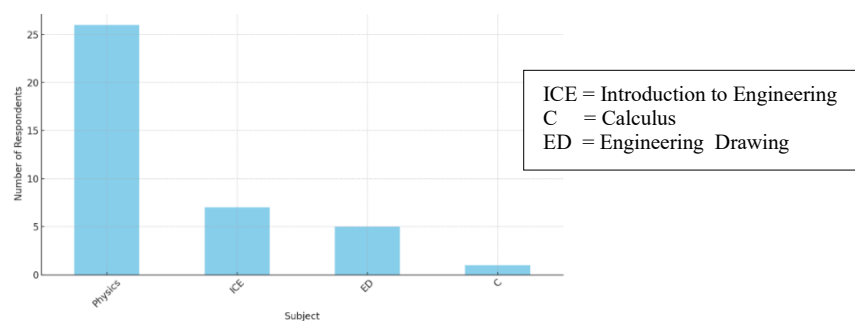


Fig. 6. Frequency of each subject being chosen as the hardest

Physics emerges as the subject perceived to be the most challenging, with the highest number of students indicating it as difficult. Then Calculus, another mathematically intensive course, also features prominently as a difficult subject but to a lesser extent. The other two subjects, ICE and ED, are also identified as challenging, with ICE being slightly more difficult than ED according to the number of students. These subjects likely pose difficulty because they introduce new technical skills and engineering concepts that students are encountering for the first time.

The subsequent analysis focuses on the grade distribution from secondary school subjects and how these grades may correlate with the perceived difficulty of subjects in the Diploma program, as summarised in Fig. 7. For Mathematics, it was observed that despite most respondents achieving an A grade, they still reported all four Diploma subjects as challenging. In the case of Additional Mathematics, the anticipated performance appears to be a significant predictor of difficulty in the Diploma subjects. It is

particularly notable that students who received C to D grades in Add Math tend to report greater difficulty across all four Diploma subjects. The influence of English language proficiency is also evident. Given that English is the medium of instruction in the university, it is imperative to consider its impact on student learning. The data suggests that students' performance in English at the secondary level is influenced by their performance in the Diploma subjects, underlining the importance of language proficiency in understanding and engaging with the course content. Across the board, respondents unanimously agreed that Physics was the most challenging subject, with Calculus being rated as the least difficult.

Lastly, it was found that 5 out of the 39 respondents expressed a lack of interest and a sense of obligation to continue with the program despite initially stating an interest in the engineering program at the time of admission. All five of these respondents were female, prominence that further investigation is needed to understand the factors contributing to this shift in attitude towards the engineering program.

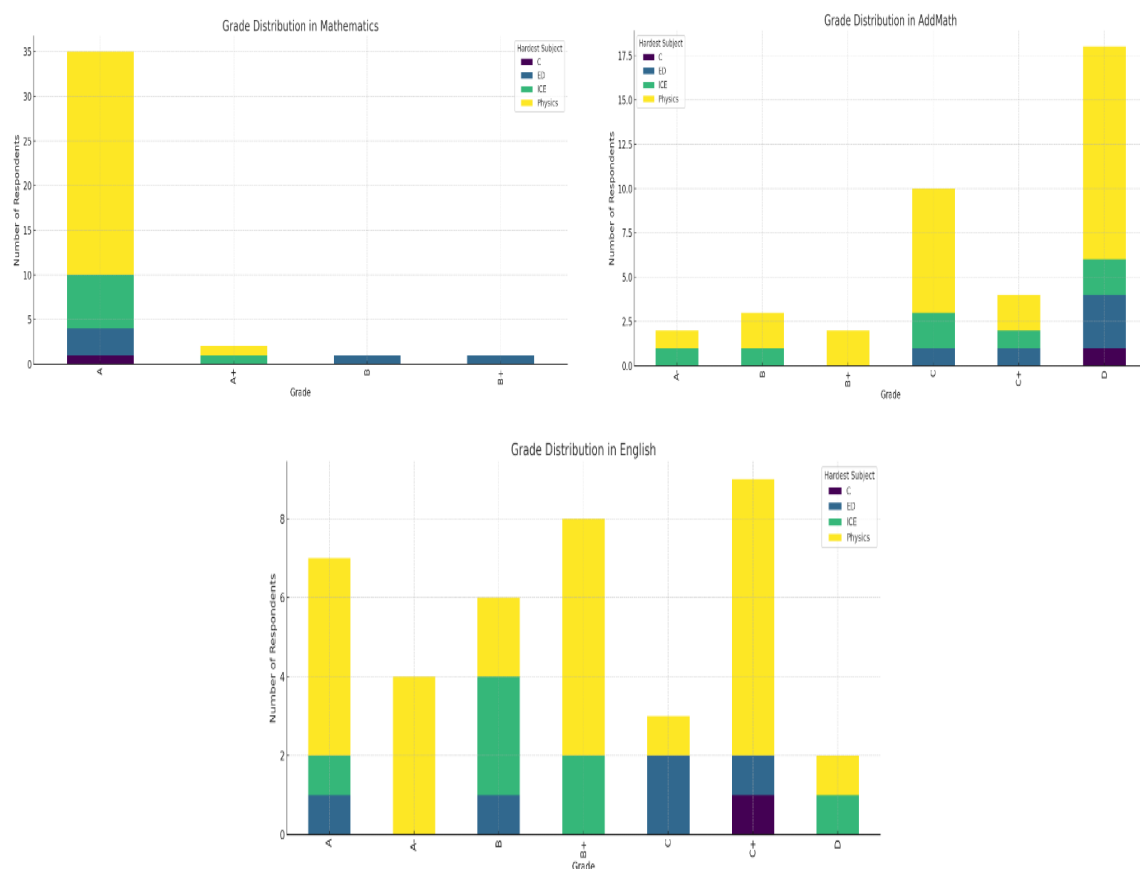


Fig. 7. Hardest choices on Diploma subject based on grade distribution

5. DISCUSSION

From this result, some area may require attention from the university administration to overcome the problems discussed. The lower satisfaction levels could stem from various factors such as the quality of food, pricing, seating comfort, cleanliness, class tools, or even the ambience of the classroom (Kärnä & Julin, 2015). A deeper dive into the specific attributes of the facility experience, possibly through follow-up questions or a focused survey, could provide more nuanced insights into the reasons behind the lower

satisfaction levels. On average, the respondent views the university's overall facilities positively, indicating that the infrastructure and resources meet or exceed their expectations. This could encompass a broad range of elements, from the quality of educational resources to the accessibility and functionality of physical spaces within the university.

The analysis of the survey data reveals several key insights into the academic challenges faced by students in the engineering program. Physics is acknowledged as the most challenging subject due to the advanced content level encountered during secondary school. This finding aligns with previous research, which has highlighted that engineering students often struggle with subjects that involve complex mathematical and analytical components (Fielding et al., 2010). As curriculum design follows program standards and guidelines rather than student needs. Instead, recommendations should focus on delivery methods or instructional strategies. This adjustment aims to mitigate feelings of being overwhelmed at the programme's outset and reduce the potential of early withdrawal from the course.

Additionally, engineering subjects heavily draw upon the principles taught in Additional Mathematics (Thabiso et al., 2024). Students who struggle with the subject at the secondary level may find it particularly demanding (Whitcomb et al., 2018). This observation is consistent with findings in international studies, which indicate that students with insufficient mathematical preparation experience lower academic satisfaction and persistence rates (Lent et al., 2016). Focused support for these students is essential to prevent them from feeling excessively burdened by the engineering program's rigour. On a side note, the use of English as the medium of teaching and learning process does not appear to be a significant obstacle. However, the student's comprehension of subject content is an area that requires attention from the lecturers. Research has shown that language barriers in technical disciplines can affect student engagement and overall satisfaction (Lin & Morrison, 2021). Lecturers can enhance their pedagogical approach by adopting interactive teaching methods such as the flipped classroom, where students engage with lecture material outside of class and use class time for discussions and practical applications (Muda et al., 2023; Wang et al., 2021). Additional interactive teaching techniques include project-based learning, where students work on real-world projects over extended periods, and peer instruction, where students teach each other under the lecturer's guidance (Ab Latif et al., 2023; Idayu Amaruddin & Hawa Rosli, 2022).

These techniques create a learning environment that is more interactive and participatory. Ensuring that students completely understand the subject content is crucial for their academic performance and self-assurance in the subject. For female students, the engineering program can offer special hurdles. Based on the survey results, it appears that these students require more resources and support to create an atmosphere that will not deter them from completing the program right away. In addition, to keep female students in the engineering program, it is critical to provide them with more assistance and supervision so that they can pursue their academic and career goals.

6. CONCLUSION

The younger generation's disinterest in pursuing higher education specifically in Engineering Diploma is a worrying trend that has to be addressed right away. The rising issues poses a significant risk to the future work force's strength and competencies, which could lower the country's ability to innovate and remain competitive internationally. Stakeholders must carefully analyse and put into practice a number of initiatives in order to prevent and reverse this alarming trend. The examination of survey data from the public university's new engineering program admissions has shed important light on this intricate problem. Subjects that largely rely on principles from Additional Mathematics, such as Physics, are seen to be the hardest, indicating substantial difficulties for pupils. These features point out important places where students face significant difficulties. Additionally, the survey found that although learning English is not a barrier in and of itself, teachers must focus on helping students understand the subject matter in English.

Based on these findings, the following recommendations are put forth:

- (i) **Curriculum Review:** Academic institutions should reassess the challenging curriculum to ensure its relevance and alignment with the programme's outcomes, making it more approachable without compromising its academic rigour.
- (ii) **Targeted Support:** Implement additional support structures, such as tutoring and mentorship programmes, particularly for students who have demonstrated difficulties in subjects foundational to engineering, like Add Math.
- (iii) **Student Engagement:** Develop targeted initiatives to support weak students in academic fields, addressing gender-specific challenges and fostering an inclusive and supportive learning environment.
- (iv) **Early Intervention:** Introduce early intervention programmes to identify at-risk students, provide counselling and support, and prevent early withdrawal from the programme.

By adopting these suggestions, we expect improvements in the current academic environment for present students. This, in turn, will foster increased educational engagement among the younger generation, ensuring a more dynamic and proficient future industry. Future research could expand the scope by conducting comparative studies across multiple universities, both locally and internationally, to examine variations in student satisfaction and identify best practices in engineering education.

The limitation of this study is that the survey was conducted within a single university, which may limit the generalisability of the findings to other institutions that have different academic structures, facilities, or student demographics. Additionally, the study focused solely on first-semester students, whose perceptions may evolve over time as they progress through their academic journey.

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CONFLICT OF INTEREST STATEMENT

The authors confirm that there is no conflict of interest in this article.

AUTHORS' CONTRIBUTIONS

Mohd Fakri Muda carried out the fieldwork and prepared the literature review. Rohaya Alias wrote the research methodology and performed the statistical analysis and interpretation of the results. Mohd Razmi Zainuddin, Mohd Hisbany Mohd Hisham, Marzuki Ab Rahman, Hamizah Mokhtar and Amminudin Ab Latif contributed significantly to the writing of the article, helped refine the arguments presented, and were actively involved in the proofreading process. They also provided feedback on the structure and flow of the paper, ensuring clarity and coherence in the final manuscript.

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