AI Reality in the Classroom: Analyzing Engineering Students' Struggles with Emerging Technology

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Abstract. The use of artificial intelligence (AI) technology is becoming increasingly important in the field of engineering and modern industries. However, students may face limitations and challenges in applying this technology in their learning. These challenges include difficulty in understanding AI concepts, lack of technical support, absence of practical training, high equipment costs, and insufficient reference materials. If these challenges are not identified and addressed, they may affect students' ability to compete in a job market that is increasingly reliant on AI technology. Therefore, the objective of this study is to assess the level of challenges faced in the use of AI technology in final year projects among Diploma in Electrical Engineering students. The study sample consisted of students enrolled in the Final Year Project course from the Diploma Kejuruteraan Elektrik, Diploma Kejuruteraan Elektrik & Elektronik, and Diploma Kejuruteraan Elektronik (Komunikasi) programme at Politeknik Kota Bharu. A total of 65 students participated in this study by completing an online questionnaire. SPSS is used for data analysis in this study, employing statistical methods such as descriptive statistics, t-tests (Two-Sample Assuming Unequal Variances) and ANOVA Single Factor to compare means across 2 and 3 independents groups. Based on data analysis, there is no statistically significant evidence to conclude that there is a difference in the average scores among different genders and different programmes. Although the findings indicate that the overall average mean scores for challenges are relatively low (2.19 and 2.43), several key issues remain. These include students' difficulty in understanding AI concepts, limited technical support from lecturers, the lack of workshops or training opportunities, and the high cost of equipment. Therefore, it is still essential to strengthen support systems to help students gain a better mastery of AI technology.

Key words: Artificial Intelligence (AI), Learning Challenges, Final Year Project

INTRODUCTION

Artificial Intelligence (AI) is currently one of the most widely discussed topics (Zarei et al., 2024; Bansal et al., 2025; Odufisan et al., 2025). The increasing accessibility and application of AI across various domains have created a pressing need to evaluate its advantages. In the education sector, AI's benefits are reflected in enhanced accuracy and efficiency, cost-effectiveness, data-driven insights, improved decision-making, and increased user satisfaction (Bonaccorsi, 2023). AI-powered educational platforms can process vast amounts of data to detect learning patterns and generate personalised recommendations, thereby enhancing student engagement and motivation. One of the most impactful contributions of AI in education is its ability to provide immediate, constructive feedback to students (Robert et al., 2024).

AI-driven automated grading systems can evaluate assignments, quizzes, and examinations in real time, enabling students to promptly identify their strengths and weaknesses. This timely feedback encourages self-reflection and facilitates continuous improvement, which in turn supports better learning outcomes. Additionally, AI promotes collaborative learning environments through intelligent tutoring systems and virtual learning assistants that facilitate group discussions, offer guidance, and foster student collaboration. These AI-enabled tools enhance active participation, critical thinking, and problem-solving abilities, thereby creating dynamic and engaging learning experiences that mirror real-world situations. Despite its potential, the use of AI in education presents challenges, particularly for students who lack the necessary technical competencies or prior exposure to AI technologies. Since AI integration often demands specific skills that are not commonly taught in traditional curricula, students without foundational knowledge may encounter difficulties in using these tools effectively. Therefore, conducting preliminary studies is essential to uncover the specific obstacles students face in adopting AI. These insights can inform educators and institutions in developing appropriate support systems.

Although AI offers numerous advantages, a significant gap remains in understanding its implementation and effectiveness, particularly among engineering students in Malaysia. A study by Duhaylungsod and Chavez (2023) found that excessive reliance on AI dialogue systems can diminish students' ability to independently analyse and comprehend information, thereby impairing their decision-making skills. Similarly, an article in Dewan Kosmik (2024) highlighted that overdependence on AI in educational settings may result in emotional isolation, as crucial human interactions that drive motivation and engagement are often reduced or neglected. Furthermore, Ali et al. (2024) reported that students commonly face challenges such as limited understanding of AI and overreliance on its functionalities, both of which negatively affect their learning experiences. Current AI systems also tend to focus predominantly on cognitive skills, often overlooking emotional intelligence (EQ), which is essential for student well-being and holistic academic development. A report by Universiti Teknologi Malaysia (2024) underscored that, although AI is effective in analysing performance and delivering immediate feedback, it cannot substitute the human values that educators provide such as empathy, care, and meaningful interaction. These findings suggest that current AI integration strategies do not fully address the comprehensive needs of students.

Accordingly, this study seeks to identify and analyse the challenges encountered by students in utilising AI for their final-year projects, with the aim of offering insights that can improve instructional guidance and support. The research specifically focuses on the unique challenges faced by diploma-level electrical engineering students in implementing AI in their final year projects within the Malaysian educational context.

The first question explored whether there was a significant difference in AI Challenge scores between male and female students. This was formally tested using the following hypotheses:

i. Null Hypothesis (H_0): There is no statistically significant difference in the mean AI Challenge scores between male and female electrical engineering diploma students in the population ($\mu Male = \mu Female$).

ii. Alternative Hypothesis (H_1): There is a statistically significant difference in the mean AI Challenge scores between male and female electrical engineering diploma students in the population ($\mu Male \neq \mu Female$).

The second research question sought to determine if different Programs of Study resulted in different AI Challenge scores, specifically whether there was a significant difference in the mean overall AI Challenge scores across the various diploma programs. The hypotheses for this inquiry were:

i. Null Hypothesis (H_0): There is no statistically significant difference in the mean overall AI Challenge scores among students from different Programs of Study (μElektrik = μElektrik&Elektronik = μElektronik (Komunikasi)).

ii. Alternative Hypothesis (H_1): At least one Program of Study has a mean overall AI Challenge score that is significantly different from the others.

LITERATURE REVIEW

Artificial Intelligence (AI) is one of the most widely discussed topics in modern times. Its application in education is growing rapidly as more AI-powered platforms and integrated solutions are developed to support and enhance the learning experience (Negoiță & Popescu, 2023). According to Chassignol et al. (2018), intelligent machines designed to operate autonomously with awareness of their environment are the goal of AI. AI refers to the use of computing systems to perform tasks such as reasoning, learning, decision-making, and information processing that typically require human intelligence. Popenici and Kerr (2017) describe Artificial Intelligence (AI) as the theoretical foundation and advancement of computer systems that can perform tasks typically requiring human intelligence, such as problem-solving, speech recognition, decision-making, and language translation.

Despite its potential, AI technology is often perceived as complex by younger students, creating a barrier to its adoption in the classroom (Kelly et al., 2019). Gray et al. (2022) emphasise that the absence of clear governance structures and a lack of resources often hinder AI integration in education, while Hsu et al. (2021) argue that a systematic implementation approach is crucial at every stage from planning to system maintenance. Nair et al. (2024) support this by highlighting that without holistic planning, AI initiatives risk becoming fragmented and ineffective. In the Malaysian context, Ali et al. (2024) reported that many polytechnic students, particularly in technical fields, struggle with understanding and applying AI due to limited exposure and insufficient support. Similarly, Mohd Nor and Rahman (2023) stress the need for AI literacy not only among students but also among educators, highlighting that institutional readiness is crucial for meaningful integration. Although various studies have investigated the benefits and applications of AI in higher education, few have specifically focused on diploma-level engineering students. In particular, limited attention has been given to how AI is utilised (or underutilised) in final-year project work, which is critical for nurturing problem-solving, innovation, and real-world technical skills.

RESEARCH METHODOLOGY

This study employed a quantitative research approach with 65 samples of session 1:2024/2025 Politeknik Kota Bharu students. This is suitable for identifying patterns, attitudes, and perceptions through statistical analysis. Quantitative research methods are particularly effective in examining relationships between variables and are widely employed in both educational and social science research (Creswell & Creswell, 2018; Sidek & Jamaludin, 2020). For this study, a structured questionnaire was developed as the primary research instrument. It was adapted from previous studies to ensure content validity and alignment with the research objectives. A 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree) was employed to gauge respondents' levels of agreement. This scale is widely regarded as suitable for capturing subjective perceptions and attitudes within educational contexts (Awang, Afthanorhan, & Asri, 2015; Mohd Rokeman, 2024). A total of 65 students participated in the study. These respondents were enrolled in the Diploma in Electrical & Electronic Engineering, Diploma in Electrical Engineering, and Diploma in Electronic (Communication) Engineering programs at Politeknik Kota Bharu. The questionnaire was administered through an online platform, and all participants completed it voluntarily. Data was analysed using the Statistical Package for the Social Sciences (SPSS). Descriptive statistics including frequency, percentage, and mean score were used to identify patterns and trends in the students' responses. Descriptive analysis is particularly useful for summarising large datasets and is commonly employed in exploratory research to detect tendencies in respondent attitudes (Alkharusi, 2022; Sidek & Jamaludin, 2020).

To address the research questions, inferential statistical analyses were conducted. An independent samples t-test assuming unequal variances (Welch's t-test) was used to compare mean AI Challenge scores between two independent groups: male and female students. This version of the t-test is considered robust and is appropriate when the assumption of equal variances is not met (Field, 2018; Ruxton & Neuhäuser, 2019). Additionally, a one-way Analysis of Variance (ANOVA) was performed to examine whether statistically significant differences existed in mean AI Challenge scores across three or more independent groups (i.e., students from different diploma programs). ANOVA is a powerful technique for comparing multiple groups means simultaneously and helps minimise the risk of Type I errors that may result from conducting multiple t-tests (Gravetter & Wallnau, 2017; Pallant, 2020). The reliability and clarity of the instrument were assessed using Cronbach's Alpha. The questionnaire was meticulously designed and validated, including expert review and pilot testing. It demonstrated excellent internal consistency with a Cronbach's alpha of .932, exceeding the 0.90 threshold typically considered "excellent" in reliability assessment (Gliem & Gliem, 2003) The interpretation of mean scores followed the categorization by Ngadiman et al. (2019), is as shown in **TABLE 1** below.

TABLE 1: Mean Scores Interpretation of Likert Scale

Score	**1.00–1.99**	**2.00–2.99**	**3.00–3.99**	**4.00–5.00**
Interpretation	Very Low	Low	Moderate	High

RESULT AND ANYLISIS

The data analysis for this research was conducted using a combination of descriptive and inferential statistical methods. Descriptive statistics were first generated to provide a comprehensive overview of the participant demographics, detailing the distribution of gender, academic semester, specific engineering diploma programs, and academic standing as indicated by HPNM ranges. For comparing the means of two independent groups with potentially different variances, an independent samples t-test (assuming unequal variances) was employed. To evaluate whether there were statistically significant differences in means across three or more independent groups, a one-way Analysis of Variance (ANOVA) was utilized. All statistical computations were performed in SPSS and a significant level of $\alpha=0.05$ was set for all hypothesis tests.

TABLE 2 shows the respondents' background, the sample consisted of 65 students from Politeknik Kota Bharu, Kelantan. Most respondents were male which is 83.1%, while the 16.9% were female. Most of the respondents are from Semester 5, accounting for nearly three-quarters (72.3%) of the sample. Semester 4 and Semester 6 (Latihan Industri) have much smaller representation, with Semester 6 being the least represented. Similar to the semester distribution, the Diploma Kejuruteraan Elektrik & Elektronik program has the highest representation, comprising 72.3% of the respondents. Diploma Kejuruteraan Elektrik and Diploma Kejuruteraan Elektronik (Komunikasi) have notably smaller numbers, with the latter being the least represented program. The distribution of HPNM (CGPA) shows a relatively even spread across the middle ranges. The largest group falls into the 3.43 - 3.67 range (30.8%), indicating a good proportion of respondents achieving strong academic performance. The next largest group is 3.00 - 3.33 (27.7%), followed closely by 2.00 - 2.99 (26.2%). The smallest group is those with the highest HPNM, 3.68 - 4.00 (15.4%).

TABLE 2: Demographics of Respondents

Item		N	%
Jantina	Lelaki	54	83.1
	Perempuan	11	16.9
Semester	4	12	18.5
	5	47	72.3
Latihan Industri	6	6	9.2
Program	Diploma Kejuruteraan Elektrik	11	16.9
	Diploma Kejuruteraan Elektrik & Elektronik	47	72.3
	Diploma Kejuruteraan Elektronik (Komunikasi)	7	10.8
HPNM	2.00 - 2.99	17	26.2
	3.00 - 3.33	18	27.7
	3.43 - 3.67	20	30.8
	3.68 - 4.00	10	15.4

Analysis of AI Challenge and Creative Idea Difficulties

TABLE 3 shows that the overall challenge level where the mean scores for AI challenges generally fall within the "Jarang" (2) to "Kadang-kadang" (3) range (1=Never, 5=Often). This suggests that students perceive these challenges as existing, but typically at a moderate frequency. There are 3 most prominent challenges, first is "Tiada peluang latihan atau bengkel untuk mempelajari AI" (C9) had the highest mean score (2.60). This indicates that the lack of training opportunities or workshops is perceived as the most significant and frequently encountered challenge by the electrical engineering diploma students. Second and third are, "Pelajar sukar memahami konsep teknologi AI" (C1) and "Sokongan teknikal daripada pensyarah mengenai AI adalah terhad" (C3), both with means of 2.55, are also significant challenges. This highlights issues related to foundational understanding and available support. Meanwhile, least prominent challenge is "Penggunaan teknologi AI membebankan pelajar dari segi masa dan usaha" (C5) which had the lowest mean score (1.97), indicating that students rarely perceive using AI as overly burdensome in terms of time and effort. This is an interesting finding, suggesting that while other barriers exist, the sheer workload associated with AI might not be their primary concern. The standard deviations are relatively high (ranging from 0.98 to 1.17). This indicates that there's a good amount of variability in student responses; not all students face the same challenges to the same degree. The 95% confidence intervals are reasonably narrow, suggesting that the sample means are relatively precise estimates of the true population means.

TABLE 3: Result and Analysis of AI Challenge

Item (Variable)	Mean	Std. Dev.	Interpretation
C1 (Sukar memahami konsep AI)	2.55	0.98	On average, students occasionally (2.55) find it difficult to understand AI concepts. This is a moderate challenge.
C2 (AI sukar diakses/tidak tersedia)	2.25	1.03	Less frequently reported; students rarely to occasionally (2.25) find AI difficult to access/unavailable.
C3 (Sokongan teknikal terhad)	2.55	1.03	Similar to C1, limited technical support is an occasional challenge.
C4 (AI perlukan kemahiran tak diajar)	2.51	1.06	Occasional challenge, with a mean of 2.51.
C5 (AI membebankan masa/ usaha)	1.97	1.17	This is the least frequently reported challenge. Students rarely (1.97) find AI use burdensome. Its wider CI suggests more varied responses.
C6 (Kekurangan bahan rujukan)	2.4	1.12	Rarely to occasionally (2.40) experience lack of reference materials.
C7 (Menyelaraskan AI & matlamat projek)	2.49	1.06	Occasionally (2.49) find it challenging to align AI with project goals.
C8 (Kos peralatan AI)	2.46	1.13	Occasionally (2.46) face challenges with AI equipment cost. Relatively high variability.
C9 (Tiada peluang latihan/ bengkel)	2.6	1.16	This is the most frequently reported challenge among AI challenges. Students occasionally too often (2.60) feel there's a lack of training/workshop opportunities.
C10 (Kurang yakin guna AI)	2.52	1.09	Occasionally (2.52) lack confidence in using AI.

TABLE 4 shows that the mean scores for creative idea difficulties (CD1-CD5) all cluster very closely around the "Neutral" point (mean of 3). This suggests that, on average, students neither strongly agree nor strongly disagree that they face significant difficulties in generating creative ideas for their FYPs. Meanwhile, "Kesukaran untuk mencari idea yang kreatif" (CD1, mean=2.98) is marginally the most agreed-upon item in this section, while "Sukar untuk menghubungkan teori dengan idea kreatif" (CD5, mean=2.82) is marginally the least. However, these differences are very small. The similarity to Section A, the standard deviations are considerable (1.03 to 1.13), indicating a wide range of individual experiences with these creative challenges. Some students might strongly agree, others strongly disagree, leading to the overall neutral average.

TABLE 4: Result and Analysis of Creative Idea Difficulties

Item (Variable)	Mean	Std. Dev.	Interpretation
CD1 (Kesukaran cari idea kreatif)	2.98	1.07	On average, students are Neutral (2.98) about difficulty finding creative ideas.

CD2 (Sukar hasilkan konsep inovatif)	2.97	1.03	Neutral (2.97) on difficulty producing innovative concepts.
CD3 (Terhad cipta idea baru/luas biasa)	2.92	1.07	Neutral (2.92) about feeling limited in creating new ideas.
CD4 (Sering kekeringan idea)	2.83	1.13	Neutral (2.83) on often runs out of ideas. Relatively high variability.
CD5 (Sukar hubungkan teori & idea kreatif)	2.82	1.09	Neutral (2.82) on difficulty connecting theory with creative ideas.

Analysis of t-Test: Two-Sample Assuming Unequal Variances

TABLE 5 presents the results of a t-Test: Two-Sample Assuming Unequal Variances was conducted to compare the overall mean AI challenge scores between male and female electrical engineering diploma students. This test is used to determine if there is a statistically significant difference between the means of two independent groups when their population variances are not assumed to be equal. The results indicated no statistically significant difference based on gender. Male students (M = 2.48, SD = 0.93, n = 54) reported a slightly higher average challenge score compared to female students (M = 2.19, SD = 0.70, n = 11).

TABLE 5: Result and Analysis of t-Test: Two-Sample Assuming Unequal Variances

	Male	***Female***
Mean	2.47962963	2.190909
Variance	0.8688225	0.494909
Observations	54	11
Hypothesized Mean Difference	0	
df	18	
t Stat	1.16821953	
P(T<=t) one-tail	0.12897949	
t Critical one-tail	1.73406361	
P(T<=t) two-tail	0.25795898	
t Critical two-tail	2.10092204	

To determine if there's a statistically significant difference between the mean scores of males and females, comparison was made between two-tailed P-value (two-tail) which is 0.25796 with the absolute value of the t Stat, 1.1682 and the t Critical two-tail value, 2.10092 where the assuming a common significance level of alpha, α is 0.05. Since P-value 0.25796 is greater than the chosen significance level 0f 0.05. Meanwhile the comparing of the t-statistic with the critical value also shows that the absolute value of the calculated t-statistic, 1.1682 is less than the critical t-value, 2.10092, so the Alternative Hypothesis (H_1) is rejected. Therefore, there is no statistically significant evidence to conclude that there is a difference in the average scores between males and females at the 0.05 significance level. The observed difference in the sample means (2.48 for males vs. 2.19 for females) could be due to random chance or sampling variability. This suggests that, within the observed sample, gender does not significantly influence the perceived challenges in utilizing AI for final-year projects.

Analysis ANOVA Single Factor

TABLE 6 provided displays the summary table of a Single Factor ANOVA (Analysis of Variance), which is a statistical test used to determine if there are any statistically significant differences between the means of three independent groups. The mean value for each group is 2.17 for Diploma Kejuruteraan Elektrik, 2.51 for Diploma Kejuruteraan Elektrik & Elektronik and 2.38 for Diploma Kejuruteraan Elektronik (Komunikasi). This shows a measure of the spread of data within each group.

TABLE 6: Summary of ANOVA Single Factor

Groups	*Count*	*Sum*	*Average*	*Variance*
Diploma Kejuruteraan Elektrik	11	23.9	2.172727	1.118182
Diploma Kejuruteraan Elektrik & Elektronik	49	122.8	2.506122	0.776837
Diploma Kejuruteraan Elektronik (Komunikasi)	6	14.3	2.383333	0.517667

TABLE 7: Result and Analysis ANOVA Single Factor

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	1.019261	2	0.50963	0.628825	0.536531	3.142809
Within Groups	51.05831	63	0.810449			
Total	52.07758	65				

TABLE 7 is a result and analysis ANOVA Single Factor, to determine if there is a statistically significant difference between the average scores of the three diploma programs, we compare the calculated F-statistic with the F-critical value and look at the P-value.

F-statistic (0.629) < F-critical (3.143)
P-value (0.537) > 0.05 (assuming a common significance level of 0.05)

Since the calculated F-statistic (0.629) is less than the F-critical value (3.143), and the P-value (0.537) is greater than the typical significance level of 0.05, so Alternative Hypothesis (H_1) is rejected. Therefore, based on this ANOVA analysis, there is no statistically significant evidence to conclude that there is a difference in the average scores among the three diploma programs (Diploma Kejuruteraan Elektrik, Diploma Kejuruteraan Elektrik & Elektronik, and Diploma Kejuruteraan Elektronik (Komunikasi)). The observed differences in the sample means are likely due to random sampling variation. Despite students reporting moderate exposure to AI-related challenges, the most pressing barrier identified "lack of training opportunities" (C9) is consistent with broader research in Malaysia's TVET and STEM education sectors, which emphasize limited infrastructure and inadequate faculty preparedness (Amdan et al., 2025). Furthermore, the absence of statistically significant differences in challenge perceptions across gender and program type suggests that these issues are systemic rather than isolated to specific groups (Jie & Kamrozzaman, 2024). This aligns with findings from the National Artificial Intelligence Roadmap 2021–2025, which highlights the urgent need for faculty development, curriculum enhancement, and institution-wide AI training to support Malaysia's AI ambitions (Ministry of Science, Technology and Innovation, 2021). Collectively, these results underscore the importance of national and institutional efforts such as targeted AI workshops, curriculum redesign, and teacher upskilling to foster AI literacy and preparedness across all diploma-level engineering disciplines.

CONCLUSION AND SUGGESTIONS

This study aimed to identify and analyse the challenges faced by diploma level electrical engineering students in integrating Artificial Intelligence (AI) into their final-year projects, with the objective of providing meaningful insights to improve AI-related support in Malaysian engineering education. Based on responses from 65 students at Politeknik Kota Bharu, the study revealed that while the overall level of AI-related challenges was relatively low to moderate, several key issues were consistently highlighted. The most significant challenges identified were the lack of access to AI workshops or training opportunities, difficulty in understanding AI concepts, and limited technical support from lecturers. These findings indicate that, although students are not overwhelmed by the technical demands of AI, there are still structural and instructional gaps that need to be addressed to support successful AI integration in academic projects. Inferential statistical analysis revealed that gender does not have a statistically significant influence on students' perceptions of AI-related challenges, as evidenced by the results of the independent samples t-test. Similarly, the findings from the one-way ANOVA indicated no significant differences in AI Challenge scores among students across the three diploma programs. Therefore, it can be inferred that these challenges are broadly experienced by students regardless of gender or academic specialization. Consequently, the results underscore the importance of adopting institution-wide strategies for AI integration rather than implementing segmented or program-specific approaches.

Considering these findings, the following recommendations are proposed to support and strengthen the integration of AI into engineering diploma programs.

i. Expand Access to Practical Training and Workshops - Institutions should provide regular, hands-on training sessions or workshops focused on AI to equip students with practical experience. These may include short courses, bootcamps, or co-urricular activities. Not only do such initiatives bridge the gap between theoretical knowledge and practical application, but they also promote student confidence in utilising AI tools.
ii. Establish Peer Learning Communities - It is recommended that institutions encourage the formation of student-led AI interest groups or communities of practice. These platforms facilitate peer-to-peer learning, foster collaborative problem-solving, and provide mutual support in navigating technical challenges related to AI.
iii. Improve Access to AI Tools and Resources - Institutions should consider subsidising essential AI tools or software licenses, or alternatively, offer shared access through university laboratories or cloud-based platforms. By doing so, students from diverse backgrounds will have equitable opportunities to engage with AI technologies.
iv. Integrate AI Topics Earlier in the Curriculum - The early introduction of AI-related content within the curriculum can be beneficial. Embedding foundational AI topics in earlier semesters may reduce conceptual difficulties later in the program, particularly during final-year projects. Furthermore, this approach can gradually build students' confidence and deepen their understanding of AI over time.

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