The Relationship Between Artificial Intelligence (AI) Literacy Level and Differentiation Problem-Solving Ability Among Engineering Students at Politeknik Kota Bharu

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Abstract **This study was conducted to identify the relationship between the level of Artificial Intelligence (AI) literacy (the use of ChatGPT, Photomath, Math Solver, etc.) and differentiation problem-solving ability among Electrical Engineering students at Politeknik Kota Bharu (PKB). One of the major challenges in Technical and Vocational Education and Training (TVET) today is ensuring that the integration of AI technology does not negatively affect students' cognitive and mathematical reasoning skills. AI literacy in this context refers to students' ability to understand, use, and critically evaluate AI technology in learning, particularly in engineering mathematics learning. A total of 122 Semester 2 Diploma in Electrical Engineering students who enrolled in the Numerical Analysis course participated in this study. The research instruments consisted of questionnaires covering demographic information, AI literacy level, and an achievement test on the topic of differentiation. The data obtained were analyzed using descriptive and inferential statistics (Pearson correlation test) through SPSS. The findings showed that the respondents consisted of 114 male students (93.4%) and 8 female students (6.6%). The majority of respondents (99.2%) were students with high academic achievement, having a Cumulative Grade Point Average (CGPA) above 3.5, while 59.0% of the students used AI only 1–3 times per week. The mean score for AI literacy level among students was 4.09, which indicates a high level. Meanwhile, the mean score for differentiation problem-solving ability was 4.05, which is also at a high level. The results of the Pearson correlation test revealed a significant and strong positive relationship between AI literacy level and differentiation problem-solving ability ($r = 0.784$, $p = 0.000$, $p < 0.05$). Therefore, the Null Hypothesis (H0) was rejected, and the Alternative Hypothesis (H1) was accepted. This analysis clearly demonstrates that an increase in students' AI literacy level is directly associated with their ability to solve Engineering Mathematics problems in the topic of differentiation.**

Keyword **: Literacy AI, Problem Solving, Differentiation, Engineering Mathematics**

I. INTRODUCTION

Nowadays, the rapidly evolving era of Industrial Revolution 4.0 and Artificial Intelligence (AI), particularly within the Technical and Vocational Education and Training (TVET) sector, demands a transformation in teaching and learning methods, especially at the higher education level. Artificial Intelligence, commonly known as AI, refers to the simulation of human intelligence programmed into machines or computer systems. Simply put, AI is a technology that enables computers to think, learn, reason (make decisions), and act on their own like humans, without needing to be rigidly programmed for every step of a task.

AI is now widely used to support the learning process, such as analyzing student data, providing personalized content, and guiding students in solving academic problems (Zawacki-Richter et al., 2019) [1]. One increasingly popular AI application is ChatGPT, a natural language processing (NLP) model capable of providing answers and guidance to students across various subjects (Brown et al., 2020) [2]. According to Long and Magerko (2020)[3], AI literacy encompasses the ability to critically evaluate technology. In the context of technical education (TVET), the integration of this technology has been found to increase student motivation (Zabidi et al., 2022)[4]. However, mastering abstract subjects like calculus still requires a deep understanding of concepts to avoid problem-solving failures (Tall, 2010)[5].

21st-century education shows rapid growth in the use of AI, particularly in education, where students can obtain accurate and fast answers using AI such as ChatGPT, Photomath, Math Solver, etc. AI provides an interactive platform that can enhance self-directed and collaborative learning (Hormes et al., 2019)[6]. AI platforms like ChatGPT, Photomath, and Math Solver are among the applications that have proven effective in supporting students by providing immediate answers across various topics (Park et al., 2022)[7].

In the engineering field, particularly Electrical, Mechanical, and Civil engineering, mastering engineering mathematics—specifically the topic of Differentiation—is an essential foundation because it is used in rate of change analysis, optimization, mathematical modeling, and engineering problem-solving. Although many students use AI like ChatGPT, Photomath, Math Solver, etc., as a learning medium, it remains unclear whether a high level of AI literacy truly helps improve actual achievement and engineering mathematics problem-solving capabilities, or if it merely increases dependency on technology. Therefore, this study focuses on identifying the relationship between the Level of Artificial Intelligence (AI) Literacy and Differentiation Problem-Solving Ability among Engineering Students at Politeknik Kota Bharu.

II. PROBLEM STATEMENT

The widespread use of AI, especially in education, has led to an increasing number of students utilizing these applications as tools to help solve problems, particularly in engineering mathematics in general and the topic of differentiation in particular. Past studies indicate that the majority of students use AI to solve problems in their fields of study; however, there are concerns regarding over-reliance, which could diminish critical thinking skills. For engineering students, mastering the topic of "differentiation" requires conceptual understanding, logical reasoning, and problem-solving skills. Nevertheless, student achievement in this topic remains moderate because they frequently face difficulties in understanding basic concepts and applying appropriate techniques in various situations.

Furthermore, although AI can explain solution steps in detail, students with low AI literacy might simply copy the answers without understanding the concepts being learned. Conversely, students with high literacy are expected to be able to use AI as a learning aid to enhance conceptual understanding and problem-solving skills

III. RESEARCH OBJECTIVES

1) To identify the level of AI literacy among engineering students.
2) To assess students' differentiation problem-solving ability.
3) To analyze the relationship between the level of AI literacy and differentiation problem-solving ability

IV. RESEARCH HYPOTHESES

H0: There is no significant relationship between the level of AI literacy and differentiation problem-solving ability.

H1: There is a significant relationship between the level of AI literacy and differentiation problem-solving ability.

V. II LITERATURE REVIEW

AI literacy is a set of competencies that enables individuals to critically evaluate AI technology, communicate, and collaborate effectively with AI (Long & Magerko, 2020)[3]. In the context of engineering mathematics education, AI literacy is not just a question-asking skill; it encompasses the ability to construct precise instructions (prompt engineering) and the ability to cross-check the validity of calculus work generated by AI (Ng et al., 2021)[8]. Latest technologies like ChatGPT, Photomath, Math Solver, etc., which are based on natural language processing (NLP), have demonstrated effectiveness in helping students understand complex concepts by providing interactive and clear responses (Brown et al., 2021) [2].

However, the level of AI awareness in higher education institutions, particularly in Malaysian Polytechnics, remains moderate (Hussin et al., 2022) [9] , where students are often less exposed to the application of this technology within formal learning contexts (Rahman et al., 2020) [10]. The level of AI literacy among polytechnic students still needs to be improved, specifically in understanding the foundations of AI technology such as calculus, algorithms, and data analysis. A study by Ibrahim and Salleh (2021) [11] suggested that

integrating AI technology into the polytechnic learning curriculum can help students see the relevance of this technology to their careers. Internationally, studies by Johnson et al. (2020) [12] and Wang et al. (2022) [13] found that institutional support, including training and access to technological resources, plays a vital role in increasing AI literacy.

Furthermore, ChatGPT has shown effectiveness in increasing student motivation and performance. According to a study by Zakaria et al. (2023) [14], students who used ChatGPT felt more confident in completing academic tasks. A similar study by Kim and Park (2023) [15] found that this AI tool helps students engage in self-directed learning by allowing them to access information at any time. Nonetheless, a major challenge is students' understanding of the limitations of this technology, such as information inaccuracy and the risk of over-dependency (Tan et al., 2023) [16]. In terms of local challenges, a study by Ramli et al. (2022) [17] showed that a lack of awareness regarding AI ethics, including plagiarism and data accuracy, is a primary issue in applying technologies like ChatGPT in educational institutions. A study by Hussain et al. (2021) [9] also suggested that intensive training programs should be held to encourage responsible AI use. Additionally, a study by Lee et al. (2022) [5] emphasized the importance of lecturers playing an active role in promoting AI tools to students.

The topic of Differentiation is a compulsory topic for electrical engineering students at Polytechnics. It is one of the main branches of calculus. Technically, differentiation is a mathematical process to find the rate of change of one variable with respect to another variable. This topic was chosen because its characteristics make it highly suitable for students to use AI as a medium to get answers quickly. According to Long and Magerko (2020)[3], AI literacy includes the capability to critically evaluate technology. In the technical education (TVET) context, integrating this technology was found to boost student motivation (Zabidi et al., 2022)[4]. However, mastering abstract subjects like calculus still requires deep conceptual understanding to avoid problem-solving failure (Tall, 2010)[5].

The topic of Differentiation is often a 'stumbling block' for Polytechnic students learning it. A study by Tall (2010) stated that students' difficulties stem from weaknesses in understanding the concept of limits and visualizing the gradient of a curve. Students often memorize formulas without understanding physical applications like the rate of change, causing them to fail when questions are presented in real-world scenarios. The use of applications like Wolfram Alpha, Symbolab, and more recently ChatGPT, Photomath, Math Solver, and others, has transformed the landscape of engineering mathematics learning. According to a study by Zabidi et al. (2022)[4] at the Malaysian Polytechnic level, the controlled use of digital learning aids can enhance student motivation. However, without high digital literacy, students risk becoming passive users who merely copy answers without understanding each step of the solution. At Politeknik Kota Bharu, students generally tend to use AI as a tool to solve problems involving differentiation, even though they sometimes merely copy answers without understanding the correct concepts. In conclusion, students with high AI literacy are able to use AI to break down complex engineering mathematics problems into smaller, more digestible parts.

III METHODOLOGY

This study is a quantitative descriptive study utilizing a questionnaire survey. The questionnaire was distributed online using Google Forms. The total sample population consisted of 180 students taking the Numerical Analysis course for Session II 2025/2026 from the Diploma in Electrical Engineering (DET) program. Therefore, the number of samples taken was 122 respondents, in accordance with the sample size determination tables provided by Krejcie & Morgan (1970) and Cohen et al. (2001)[18] .

The analysis conducted included frequencies, mean scores, and Pearson Correlation. The development of the research instrument was self-constructed by the researcher based on concepts and views put forward by previous researchers. The questionnaire contains three sections: Section A contains respondents' demographic information, Section B contains AI Literacy level items, and Section C contains mathematics problem-solving ability items. To analyze the findings, mean score interpretations based on Pallant (2007)[19] were used.

Before the actual study was carried out on the sample, the researcher conducted a pilot study on the questionnaire to collect data from respondents. A total of 10 respondents were involved in this pilot study, consisting of 10 students taking the Numerical Analysis course for Session II 2025/2026. The purpose was to measure the reliability coefficient of the research instrument questionnaire used. Generally, reliability is a measure of a research instrument's ability to measure research problems consistently every time it is used. According to Mohammad Najib (1999), the reliability of a questionnaire is high if the Cronbach's Alpha value exceeds 0.80, indicating that respondents answered the questions or statements consistently. He provided

general guidelines regarding Cronbach's Alpha to describe the strength of the relationship as shown in Table 1, while the coefficient values obtained across physical, psychological, and social aspects are shown in Table 2.

TABLE 1 :
CRONBACH ALPHA COEFFICIENT RANGE (GENERAL RULE)

Alpha Coefficient Range	*Strength Of Relationship*
<0.6	Lemah
0.6 < 0.7	Sedehana
0.7 < 0.8	Baik
0.8 < 0.9	Sangat Baik
0.9	Terbaik

TABLE 2:
COEFFICIENT VALUES OBTAINED

Variable	*N*	*Cronbach Alpha*	**Level**
AI Literacy Level	10	0.928	Excellent
Differentiation Problem-Solving Ability	10	0.929	Excellent

IV DATA ANALYSIS

A. Sample Background

According to Gay and Airasian (2003)[20], a population is the researcher's target group, the group to whom the findings of the study will be generalized. A research sample, on the other hand, consists of the respondents selected to represent a population. Defining the research population is crucial because it determines how and how many samples will be selected to obtain data sources. The population for this study comprised 180 students taking the Numerical Analysis course for the Diploma in Electrical Engineering (DET) program offered at Politeknik Kota Bharu for Session II 2025/2026.

According to Krejcie and Morgan (1970)[18], sample size determination is based on the total population. Therefore, the total sample size taken for this study was 122 people. A total of 122 questionnaire forms were distributed online via Google Forms to all students taking the Numerical Analysis course for the Diploma in Electrical Engineering (DET) program offered at Politeknik Kota Bharu for Session II 2025/2026. All received questionnaires were processed and analyzed. The 122 respondents consisted of 114 male students (93.4%) and 8 female students (6.6%). In terms of ethnicity, 114 respondents were Malay (93.4%) and 8 were Chinese (6.6%).

Regarding the frequency of AI use, 72 students (59%) used AI 1 to 3 times a week. This was followed by respondents using AI 4–5 times, totaling 37 students (30.3%). Meanwhile, the remaining 13 students (10.7%) were categorized as heavy users who used AI tools very frequently, exceeding 5 times. This shows that the majority of engineering students at Politeknik Kota Bharu are exposed to and utilize AI technology in their daily routines at a controlled level.

B. Final Examination Results Analysis

Table 3 below shows the frequency distribution and percentages for the latest Cumulative Grade Point Average (CGPA/HPNM) obtained by the respondents to illustrate their background achievement related to the differentiation topic. From the analysis, the respondents appeared highly homogenous and stood at an exceptionally high level of excellence. A total of 99.2% of the sample (121 students) achieved a CGPA exceeding 3.5. Meanwhile, only one respondent (0.8%) recorded a CGPA within the 3.01 to 3.50 scale range.

This analysis indicates that the vast majority involved in this study are high-achieving students. This excellent academic achievement likely influences their ability to manage digital competencies and logical thinking when

dealing with engineering mathematics problem-solving.

TABLE 3:
FINAL EXAMINATION RESULTS ANALYSIS

Category (GPA/CGPA)	Number of Students by Grade	% of Students by Grade
>3.5	121	99.2
3.01-3.50	1	0.8
Total	122	100.00

C. **Mean Analysis of AI Literacy Level**

In this study, to identify the AI literacy level, data were analysed in the form of mean scores using SPSS version 21.0 software. The item mean scores used the mean score interpretation put forward by Mohammad Najib Abdul Ghafar (2003) as shown in Table 4.

TABLE 4
INTERPRETATION OF MEAN SCORES

Score Range	**Mean Score Interpretation**
1.00 – 1.50	Very Low
1.51 – 2.50	Low
2.51 – 3.50	Moderate
3.51 – 4.50	High
4.51 – 5.00	Very High

TABLE 5:
MEAN ANALYSIS FOR IDENTIFYING AI LITERACY LEVELS

NO	**ITEM**	**MEAN**	**STD DEV**
1.	I know how to construct a clear prompt (instruction) to get differentiation calculation steps from AI (ChatGPT, Photomath, etc.)	4.12	0.990
2.	I can differentiate between AI tools that give direct answers (Photomath) and AI that explains concepts (ChatGPT).	4.20	1.019
3.	I always cross-check the workings provided by AI (ChatGPT, Photomath, etc.) to ensure there are no calculation errors (AI hallucination).	4.07	0.936
4.	I use AI (ChatGPT, Photomath, etc.) to understand the theory behind Differentiation or Integration formulas, not just to look for answers	3.95	0.936
5.	I am skilled at using AI (ChatGPT, Photomath, etc.) to convert word problems into mathematical equations.	4.11	0.803
	Total	4.09	0.917

It was found that all evaluated items had mean values at a high level based on Mohammad Najib Abdul Ghafar's (2003)[21] interpretation, with the overall item mean standing at a high level of 4.09. This indicates that students possess excellent awareness, critical skills, and application capabilities in handling AI technology for learning purposes, particularly in solving differentiation problems.

In detail, Item 2 recorded the highest mean value of 4.20 (Standard deviation 0.878). This shows that students have high cognitive abilities to differentiate between different AI tools, whether they provide direct solutions (like Photomath) or explain concepts (like ChatGPT, Mathsolver, etc.). This awareness is strongly supported by Item 3 *(referred to as Item 1 in some parts of text descriptions)*, which obtained the second-highest mean value of 4.11 indicating that students do not blindly accept AI answers; instead, they practice a healthy sceptical approach by rechecking workings to avoid error or AI data hallucination issues.

Furthermore, Item 1 recorded a mean value of 4.12 . Although still at a high level, this implies that a small number of students still require formal additional guidance in prompt engineering to enable them to construct more optimal and structured instructions for extracting calculus steps accurately. Meanwhile, Items 4 and 5 obtained mean values of 3.95 and 4.11 respectively, which are also at high levels. This reflects a positive motivation for AI use, where students leverage AI as a cognitive scaffold to understand the theory behind differentiation formulas and to help translate complex contextual word problems into clear mathematical modelling.

D. **Mean Analysis of Differentiation Problem-Solving Ability Level**

TABLE 6:
MEAN ANALYSIS OF DIFFERENTIATION PROBLEM-SOLVING ABILITY

NO	ITEM	MEAN	STD DEV
1	I am able to identify the correct Differentiation method for complex questions.	3.98	0.975
2	I can solve differentiation calculations manually without relying entirely on digital tools.	3.99	0.858
3	I understand how to apply the topic "Application of Differentiation" in real engineering problems	4.42	0.663
4	When AI (ChatGPT, Photomath, etc.) provides a wrong answer, I am able to detect where the mistake lies based on my conceptual understanding.	4.20	0.833
5	Using AI (ChatGPT, Photomath, etc.) helps me master complex problem-solving techniques faster compared to traditional learning.	3.61	1.124
6	I am able to solve differentiation questions involving the combination of two functions	4.15	0.820
7	I am able to solve differentiation questions involving the combination of two functions. *(Duplicate item)*	3.93	0.874
8	I understand the difference between first-order and second-order differentiation and their functions.	3.88	0.950
9	I feel more confident solving complex differentiation problems after referring to the step-by-step workings shown by AI (ChatGPT, Photomath, etc.).	4.16	0.882

10	I can solve differentiation problems without AI assistance if the basic	4.20	0.833
	concepts have been explained by AI previously.		
TOTAL	4.052	0.881	TOTAL

The results of the mean analysis for the Differentiation Problem-Solving Ability Level are displayed in Table 6

Overall, the results indicate that the differentiation problem-solving ability among engineering students at Politeknik Kota Bharu is at a high level, with an overall mean average of 4.052 (standard deviation 0.8812). Most items recorded mean scores above 3.90, reflecting solid mathematical confidence and competence. Item 3 showed the highest mean value of 4.42 (Standard deviation 0.663), proving that students have an excellent capability to connect calculus mathematics with their technical engineering context.

Meanwhile, items related to the ability to detect calculation errors—namely Item 4 and Item 10 *(referred to as Item 9 in text description)*—scored 4.20, which is among the highest. This shows that students possess a strong conceptual foundation and do not rely blindly on devices. Item 9 showed that students feel more confident in solving complex differentiation problems after referring to structured step-by-step workings shown by AI, yields a high mean score of 4.16 (standard deviation 0.882).

Conversely, the item *"Using AI helps me master complex problem-solving techniques faster compared to traditional learning"* recorded the lowest mean value of 3.61 (standard deviation 1.124). Although still within the moderate-high range, the large standard deviation value indicates a significant variation in student perspectives. Some students still view traditional learning methods (lectures/manual exercises) as critical and irreplaceable by the speed of AI technology.

E. **Relationship Between AI Literacy Level and Differentiation Problem-Solving Ability**

To analyse the relationship between the level of AI literacy and differentiation problem-solving ability among engineering students at Politeknik Kota Bharu, a Pearson correlation test was conducted. To address this research question, an inferential statistical procedure utilizing the Pearson product-moment correlation coefficient (r) was used. In this analysis, the dependent variable was the level of AI literacy, while differentiation problem-solving ability acted as the independent variable (Note: Teks asal bertukar istilah pembolehubah bersandar/tidak bersandar). To interpret the strength of this relationship, the researcher referred to the interpretations proposed by Rowntree (1981) in Mohammad Najib (1999)[21]. Generally, three types of relationships exist in correlation studies: positive relationships, negative relationships, and no relationship. Within positive and negative relationships, specific levels indicate whether the association is high, moderate, or low, as referenced in Table 7

TABLE 7:
CORRELATION COEFFICIENT (POSITIVE AND NEGATIVE)

Relationship (Positive & Negative)	Level of Relationship
0.80 – 1.00	Very High
0.60 – 0.79	High
0.40 – 0.59	Moderate
0.20 – 0.39	Weak/Low
0.00 – 0.19	Weak/Very Low

TABLE 8:
CORRELATION ANALYSIS OF THE RELATIONSHIP BETWEEN AI LITERACY LEVEL AND DIFFERENTIATION PROBLEM-SOLVING ABILITY

Variable	**Correlation Value, r**	**Significance Level, p**

AI Literacy Level	0.784	0.000

Fromanalysis in Table 8, a Pearson Correlation was calculated between the components. It was found that there is a significant and strong positive relationship between students' AI literacy levels and their differentiation problem-solving ability. The significance value (2-tailed) obtained was r = 0.784, p = 0.000, which is far smaller than the alpha significance level set at alpha = 0.05 ($p < 0.05$). Therefore, this strong statistical evidence successfully rejects the Null Hypothesis (H0) and accepts the Alternative Hypothesis (H1). This value indicates that the strength of the correlation coefficient is categorized as a high and strong relationship.

According to guidelines for interpreting correlation coefficient sizes (e.g., Chua, 2011 or Cohen, 1988), an r value within the 0.70 to 0.90 range is categorized as having a high and strong relationship strength. The positive direction of the correlation implies that both variables move in tandem. This means that an increase in students' AI literacy level (Section B) is directly related to an increase in their ability to solve mathematical problems for the Differentiation topic (Section C). This finding proves empirically that critical digital skills (such as prompt engineering, choosing the right AI application, and checking for AI hallucination errors) positively support students' cognitive performance in abstract and complex engineering mathematics subjects.

F. Differentiation Test Performance Analysis

TABLE 9:
DIFFERENTIATION TEST ANALYSIS

Marks	Number of Students by Grade	% of Students by Grade
0-10	1	0.8
11-20	23	18.9
21-30	98	80.3
Total	122	100.00

The test evaluation analysis shows that differentiation problem-solving performance among PKB engineering students overall is at a very high and excellent level. In detail, the vast majority of respondents, totaling 98 students (80.3%), managed to master this topic excellently by obtaining the highest scores within the 21 to 30 marks range. This was followed by a group of respondents at a moderately satisfactory level, consisting of 23 students (18.9%) within the 11 to 20 marks range. Meanwhile, only one student (0.8%) recorded a weak result, scoring in the 0 to 10 range. This finding provides a clear picture that the majority of engineering students in the sample possess solid competency, meticulousness, and mastery of differentiation formulas and concepts (such as Product Rule, Chain Rule, and rate of change applications) when sitting for the written test

G. Relationship Between AI Literacy Level and Test Performance

TABLE 10:
CORRELATION ANALYSIS OF THE RELATIONSHIP BETWEEN TEST PERFORMANCE AND AI LITERACY LEVEL

Variable	Correlation Value, r	Significance Level, p
Test Performance	0.031	0.737

Based on the inferential analysis in Table 10, the Pearson Correlation test shows that there is no significant relationship between actual test achievement marks (TEST) and the level of AI literacy (PURATA_B) among engineering students at Politeknik Kota Bharu (r = 0.031, $p > 0.05$). The significance value obtained was p = 0.737, which is larger than the significance level alpha = 0.05. Meanwhile, the correlation coefficient value (r = 0.031) indicates a very weak or almost non-existent relationship strength. Therefore, the Null Hypothesis (H0) failed to be rejected.

This finding proves that having a high level of AI literacy (knowing how to use AI, prompt engineering, understanding the functions of ChatGPT, Photomath, Math Solver) does not automatically guarantee that students will obtain high marks in written engineering mathematics tests (TEST). Mastering the topic of Differentiation still requires manual cognitive skills and consistent traditional calculation practice. This study demonstrates that the demographic profile of respondents shows 99.2% are excellent students (CGPA > 3.50); this group of students is inherently intelligent and capable of answering test questions well, regardless of whether they possess AI literacy or not. Therefore, the existence of AI is not a determining factor (differentiator) for their written exam marks

V DISCUSSION

Overall, this study was conducted to examine the extent of the relationship between AI literacy levels and differentiation problem-solving ability. This study sought to answer: "Will students who are smart at using AI (possessing high AI literacy) become more efficient and accurate in structuring steps to solve these difficult differentiation questions?" The analysis results prove that students with high AI literacy indeed possess very good capabilities in solving these Differentiation problems. This is evident where 99.2% of the respondents are students with very high academic achievement (CGPA > 3.50). In terms of usage distribution, 59.0% of students fall into the moderate frequency level (1 to 3 times). This finding indicates that the group of excellent electrical engineering students at PKB is not "obsessed" with or overly dependent on devices all the time; they act wisely by using AI as an agent to check calculus steps, adopting a suitable and strategic usage approach, and only referring to AI when facing specific conceptual understanding constraints.

This study concludes that critically increasing digital literacy brings a huge positive impact on the technical academic competency of TVET students. Students who handle AI ethically have a higher capability to structure difficult differentiation workflows (such as Product Rule, Chain Rule, and rate of change applications). This is because high AI literacy trains computational thinking and students' metacognitive skills—namely the ability to think about how they solve problems, organize prompt instructions, and analyze system errors. Overall, AI technology is merely a supporting tool (scaffolding) for engineering students; however, actual mathematical understanding still depends on the students' own efforts and calculation practice.

VI RECOMMENDATION

Based on the positive implications of this study's findings, several recommendations are put forward to stakeholders:

Department of Mathematics, Science, and Computer (JMSK) PKB:

- It is recommended that the Engineering Mathematics curriculum no longer bans AI use totally; instead, it should integrate an AI-Assisted Learning syllabus.
- Formal exposure regarding Prompt Engineering for Technical Mathematics needs to be provided to students so that the lowest mean related to AI instruction-building skills can be increased.

Polytechnic Lecturers:

- Lecturers need to shift their roles from rigid information providers to digital ethics facilitators.
- Mathematics assignments can be redesigned by asking students to submit critical reflections: evaluating and correcting differentiation workflows deliberately generated with errors by AI. This aligns with the strengths of students who are skilled at detecting errors.

Future Research:

- Given that 99.2% of the sample was dominated by excellent students, further research is recommended to expand the study sample to lower or medium-achieving student groups to see whether the impact of AI scaffolding provides the same or a different correlation pattern.

VI CONCLUSION

In conclusion, this study successfully achieved all the outlined objectives. This study concludes that the traditional mindset assuming the presence of generative AI will make students lazy to think is incorrect,

provided that students are equipped with a high level of AI Literacy. For engineering students at Politeknik Kota Bharu, mastering wise, critical, and ethical AI literacy is proven to be a primary agent driving their capability to master the challenging topic of calculus differentiation. Existing academic excellence, manual guidance from lecturers, and mature use of AI technology represent the best formula for producing future TVET graduates who are holistic, digitally competent, and competitive in facing high-tech industrial waves (IR 4.0).

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