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Implementation of the SAU10212 Telegram Bot in Vehicle Electrical Systems: An Evaluation of Usability, Acceptance, and Student Performance at Pasir Salak Community College

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Abstract

The integration of digital technology in higher education has facilitated more interactive and engaging pedagogical practices, consistent with the objectives of the Malaysia Higher Education Plan (RPTM) for 2026 - 2035. Traditional pedagogical approaches in technical disciplines are frequently hindered by limited access to responsive and interactive reference tools. Consequently, students struggle to visualize intricate vehicle electrical systems using static manuals, ultimately affecting their practical proficiency within continuous assessments. This study established three primary objectives: to evaluate the usability of SAU10212 Telegram Bot as a digital support platform, to identify student acceptance, and to compare overall student performance before and after the bot's implementation. Utilizing a census sampling technique, data were gathered from a total population of 54 students enrolled in the first semester of the automotive technology program across two academic sessions. To ensure a comprehensive evaluation, survey-based data were synthesized with a longitudinal analysis of student marks across two academic sessions. Descriptive statistical analysis conducted using SPSS Version 31 yielded high mean scores for interface configuration (4.34), functional evaluation (4.32), and user validation (4.36), indicating strong usability and widespread student acceptance. Furthermore, a comparative analysis of student performance across sessions revealed a positive upward trend following the bot's introduction. In summary, the SAU10212 Telegram Bot functions as a robust digital support mechanism, promoting a flexible learning environment that substantially enhances educational outcomes for vehicle electrical systems module.

Keywords: *Automotive technology; digital; education; SAU10212 Telegram Bot; vehicle electrical systems*

I. INTRODUCTION

Amid the demands of the Fourth Industrial Revolution (IR 4.0) and the Malaysia Higher Education Blueprint 2026–2035, higher education sector is currently experiencing a paradigm shift in its delivery and structure. Within this evolving landscape, the integration of technology into teaching and learning has shifted from a supplementary practice to a fundamental requirement for maintaining pedagogical relevance and effectiveness [1]. However, the transition towards digitalisation is accompanied by various complexities, as institutions such as Pasir Salak Community College must critically evaluate and adapt their instructional approaches to ensure meaningful and impactful technology adoption rather than superficial implementation. While digital tools offer significant potential, their effectiveness is contingent upon thoughtful integration that aligns with learning outcomes and student needs. Digital learning environments cultivate student creativity and bolster academic self-efficacy, thereby fostering intrinsic motivation and encouraging learners to explore innovative problem-solving strategies beyond conventional methodologies.

A critical examination reveals a persistent gap between traditional and contemporary pedagogical practices. Conventional approaches remain predominantly lecturer-centred and unidirectional, relying heavily on static resources such as whiteboards and printed materials. These methods are increasingly inadequate in supporting deep conceptual understanding, particularly in technically demanding modules such as Vehicle Electrical Systems (SAU 10212). Furthermore, the limitation of learning interactions to scheduled classroom sessions constrains opportunities for continuous engagement, often resulting in passive learning behaviours and limited knowledge retention.

In contrast, technology-enhanced learning environments provide greater flexibility and interactivity; however, their success depends on how

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effectively they are designed and implemented. Digital learning platforms enable multimodal content delivery such as videos, simulations, and formative assessments that can facilitate active learning [2]. Nevertheless, without structured guidance, such platforms risk becoming repositories of information rather than tools for meaningful learning engagement. Therefore, the emphasis should not solely be on technological adoption but on pedagogical transformation that promotes active participation and self-directed learning.

In response to these challenges, the implementation of a Telegram Bot in the Automotive Technology department at Pasir Salak Community College represents a targeted effort to bridge the gap between technology and pedagogy. Unlike conventional approaches, the Telegram Bot offers structured access to learning materials, interactive features, and continuous engagement opportunities. More importantly, it serves as a pedagogically aligned intervention aimed at enhancing students' academic performance.

II. RESEARCH OBJECTIVES

This study aims to evaluate the implementation of the SAU10212 Telegram Bot in the Vehicle Electrical Systems course at Pasir Salak Community College. The specific objectives are as follows:

1. To evaluate the usability of the SAU10212 Telegram Bot as a digital learning support platform for students in the Automotive Technology department.
2. To identify students' acceptance of the SAU10212 Telegram Bot in supporting teaching and learning activities.
3. To compare overall student performance between academic sessions before and after the implementation of the SAU10212 Telegram Bot.

III. LITERATURE REVIEW

A. Malaysia Higher Education Blueprint 2026–2035

The Malaysia Higher Education Blueprint (MHEB) 2026-2035 is a strategic roadmap designed to transform the nation's higher education system into a resilient, inclusive, and globally competitive ecosystem. Building on the foundations of the previous 2015-2025 blueprint [3], this new framework shifts focus on humanity-centric education, lifelong learning, and sustainability. Driving excellence within the national education framework necessitates a commitment to the concept of lifelong and life-wide learning. Consequently, educators are required to continuously adapt to emerging instructional methodologies and digital competencies [4].

By embracing these modern practices, ensure that the education delivered remains aligned with the complex demands of the current era.

B. Revolutionizing Education Through Interactive Learning

Digital Transformation in Technical and Vocational Education and Training (TVET) is no longer a matter of choice; rather, it has become an absolute imperative to ensure that the delivery of knowledge remains relevant [5]. Technological advancement is intrinsically linked to education through the necessity of training and the mastery of computer skills in daily life. Within the context of TVET, the utilization of digital tools is instrumental in facilitating the comprehension of technical concepts that are difficult to visualize via traditional methods, thereby enhancing the overall pedagogical efficacy of the learning activities [6]. In other words, the strategic use of creative and innovative teaching approaches fosters an environment where students can effectively integrate information while stimulating their critical and analytical thinking capabilities [7].

C. Teaching Methods

Extensive literature establishes a correlation between instructional methodologies and levels of student achievement, where method applied in teaching and learning sessions is seen to influence the transformation of the students' cognitive development [8]. This began as educational delivery models underwent an abrupt transition in response to the global pandemic COVID-19. These conditions demand enhanced efficiency and flexibility in instructional delivery, particularly when face-to-face learning is not feasible. Utilizing self-learning modules as a teaching method effectively reshapes students' understandings [9]. This development is achieved through a collaborative dynamic where students interact deeply with their instructors, their classmates, and the provided educational content.

D. Students Performance

Within the framework of this study, the concept of student performance is operationalized as academic achievement measured through standardized examinations. The Vehicle Electrical System module relies on continuous assessment (practical skills) to gauge a student's depth of mastery and technical proficiency, aligning with current quality assurance standards in Automotive Technology curriculum. Consequently, the outcomes are

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quantitatively analyzed using a structured scoring system and standardized grading classifications, as delineated in Table 1 [10].

Table 1: Continuous Assessment Score and Grade in Community College [10].

Marks	Grade Point	Grade	Status
90 - 100	4.00	A+	Excellent
80 - 89	4.00	A	Excellent
75 - 79	3.67	A-	Excellent
70 - 74	3.33	B+	Credit
65 - 69	3.00	B	Credit
60 - 64	2.67	B-	Credit
55 - 59	2.33	C+	Pass
50 - 54	2.00	C	Pass
47 - 49	1.67	C-	Pass
44 - 46	1.33	D+	Pass
40 - 43	1.00	D	Pass
30 - 39	0.67	E	Fail
20 - 29	0.33	E-	Fail
0 - 19	0.00	F	Fail

E. Telegram Bot as A Learning Platform

Smartphones serve as a primary vehicle for digital fluency, allowing students to utilize emerging technologies to engage in autonomous, adaptive learning outside of traditional classroom settings. As a free and user-friendly messaging application, Telegram provides various functionalities that facilitate flexible educational pathways. Its status as one of the most accessible digital tools aligns to support self-learning medium [11]. Telegram bots are more than just automated scripts; they are integrated assistants that live right in the chat list. By handling everything from scheduled reminders and real-time data retrieval to complex group moderation, these bots evolve Telegram from a simple messaging app into a comprehensive productivity hub. Instead of relying on practical static worksheet, chatbots offer a creative alternative by grounding learning in genuine, real-time dialogue. This shifts the focus from rote memorization to active communication, allowing users to apply their skills in a natural context [12].

IV. METHODOLOGY

Figure 1 below represents the flow chart in evaluating the implementation of Telegram Bot. Consequently, this flowchart is vital for outlining the critical procedures within the framework. To ensure long-term sustainability, future enhancements will prioritize the integration of AI-driven analytics and adaptive learning features. This optimization aims to elevate student readiness and align the SAU10212 module with the latest IR 4.0 standards.

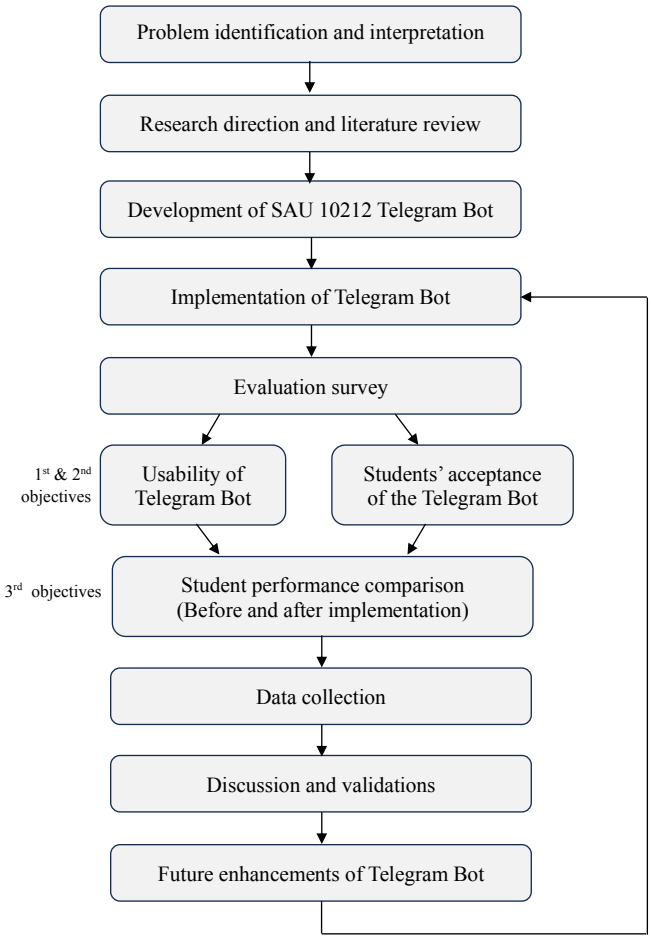

Figure 1: Flow chart of research methodology.

This study employed a quantitative evaluative research design to assess the implementation of the SAU10212 Telegram Bot in the Vehicle Electrical Systems course. The study involved 54 students from the Automotive Technology department at Pasir Salak Community College. The study employed a census sampling technique to ensure a comprehensive evaluation of the Telegram bot's integration. The participant pool consisted of the entire population of students (N=54) enrolled in the Vehicle Electrical Systems (SAU10212) course at Pasir Salak Community College during 1st semester academic session. By utilizing a census approach rather than a partial sample, this study eliminated potential sampling bias and ensured that the data reflected the collective experience of the entire student cohort interacting with the telegram bot. This total population sampling strengthens the study's rigor, as the findings represent the complete localized context of the implementation.

Data collection was conducted using a structured questionnaire distributed through Telegram application, together with overall student mark data

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from two academic sessions. The questionnaire consisted of four sections:

i. Section A: Demographic Information
ii. Section B: Interface Configuration
iii. Section C: Functional Evaluation
iv. Section D: User Validation

Data analysis was conducted using Statistical Package for the Social Science (SPSS) Version 31.0. To ensure clarity, responses were calculated as percentages and illustrated using a combination of tables and figures. Finally, the findings correlated with three of the research objectives, helping to form a clearer understanding of students' experiences with the telegram bot. The analysis of the survey results follows the mean interpretation model [13]. As outlined in Table 2, this scale provides a systematic basis for determining the significance of the mean scores, allowing for a clearer understanding of the respondents' perceptions regarding the Telegram bot for Vehicle Electrical System module.

Table 2: Min score scale and interpretation [13].

Mean Score	Interpretation
1.00 - 2.33	Low
2.34 - 3.66	Medium
3.67 - 5.00	High

The research instrument employed a five-point Likert scale, a specialized psychometric tool utilized to quantify respondent attitudes, opinions, and perceptions. Table 3 assigned a five-point Likert scale ranging from Strongly Disagree to Strongly Agree applied in the research. Moving beyond binary yes or no responses, this scale enables participants to articulate their intensity of agreement regarding a specific construct [14]. By assigning a numerical weight to each ordinal response, the data can be subjected to quantitative analysis through the calculation of mean scores.

Table 3: Five-point Likert scale

Likert scale	Point
Strongly Agree	5
Agree	4
Neither Agree nor Disagree	3
Disagree	2
Strongly Disagree	1

In addition, to examine student performance, overall marks from two academic sessions were compared descriptively to observe performance trends before and after the implementation of the SAU10212 Telegram Bot. This comparison was used as supporting evidence in evaluating the educational value of the bot in the teaching and learning process.

V. RESULT AND DISCUSSION

A. Demographic Profile

Figure 2 illustrates the distribution of respondents' gender from the automotive department. It indicates that most of the respondents are male students which is 94.4% and 5.6% are female students. Needless to say, the survey population is predominantly male in Section A.

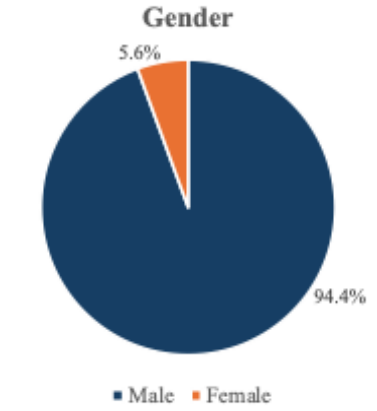

Figure 2: Respondents' gender distribution

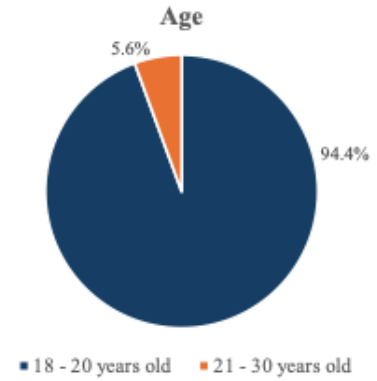

Figure 3: Respondents' age distribution

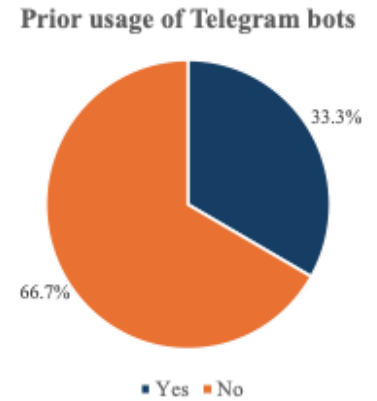

Figure 4: Respondents' prior usage of Telegram bot

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Meanwhile, Figure 3 shows the total respondents distributed according to their age. The majority of respondents fall within the 18–20 age bracket (94.4%). The rest of the respondents represent an insignificant amount where 5.6% of them are grouped within the 21-30 age bracket. In addition, the respondent profile aligns with the academic background of the target sample, consisting of 1st semester automotive technology students currently enrolled in the Vehicle Electrical System module. Lastly, the chart in Figure 4 illustrates the level of familiarity and previous experience respondents have with Telegram bots prior to this study. A significant majority of the participants (66.7%) indicated that they had no prior experience using Telegram bots. In contrast, only 33.3% (one-third) of the respondents reported having used a Telegram bot previously. This suggests that for most students, the bot represents a fresh approach to learning simultaneously allowing for a clear evaluation of how such tools can ease the learning curve associated with technical subjects.

B. Interface Configuration

Table 4 represents the score mean, standard deviation and level of interpretation for each item in Section B. The results show a consistently high level of satisfaction across all dimensions of the bot's interface, in which the highest score mean indicates that the bot is exceptionally mobile friendly. This is crucial for digital learning, as it ensures students can access the Vehicle Electrical System materials seamlessly on their smartphones without technical barriers. With mean scores ranging from 4.22 to 4.41, it is evident that the participants perceive the bot as a high-quality digital tool. The minimal Standard Deviation (SD) below 0.700 across all items suggests that student opinions were closely aligned. This lack of significant deviation highlights a strong collective agreement regarding the effectiveness of the bot. Thus, the overall mean score for Section B is 4.34, thereby affirming the effective interface configuration of the bot.

Table 4: Mean scores of Section B

Items	Score Mean	SD	Level
The bot features a simple and visually appealing user interface.	4.30	.633	High
The content displayed within the bot is clear and easily understood.	4.37	.560	High
The color scheme and overall visual tone of the bot are appropriate.	4.22	.664	High
The bot is engaging and effectively captures user attention, encouraging sustained usage.	4.39	.627	High
The bot is user-friendly and highly accessible on smartphones.	4.41	.659	High
The layout of items within the bot is well-organized, and information is presented clearly.	4.35	.555	High

C. Functional Evaluation

Table 5 reveals that the bot maintains a high standard of operational efficiency, with mean scores across all six items ranging from 4.24 to 4.37. These results categorize the bot's performance as High according to the Likert scale interpretation. The highest mean scores were recorded to show that the bot has successfully simplifies the learning process for students. Meanwhile, the low Standard Deviation (SD) values (ranging from 0.560 to 0.671) further confirm that respondent feedback indicating a unified positive user experience. In summary, the cumulative mean score for Section C is 4.32, leading to high usability standards of the telegram bot. These findings suggest that the bot facilitates asynchronous learning, where students can revisit difficult concepts such as relay connection to other components until they achieve practical mastery.

Table 5: Mean scores of Section C

Items	Score Mean	SD	Level
The bot is highly accessible and easy to navigate.	4.28	.627	High

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The bot demonstrates optimal performance without any technical issues.	4.24	.671	High
The bot provides rapid response times and efficient data loading.	4.35	.588	High
The bot facilitates student access to relevant learning resources.	4.33	.614	High
The bot provides all the essential functions and features required for educational purposes.	4.37	.592	High
The bot is an intuitive platform designed to support and simplify student learning processes.	4.37	.560	High

D. User Validation

The findings from Table 6 highlight the pedagogical efficacy of the bot. With a cumulative high mean, the results underscore the bot's ability to support students self-learning within the Vehicle Electrical Systems module. Ultimately, the bot serves as a successful bridge between traditional instruction and IR 4.0 technological standards, providing students with a modern, immersive, and highly beneficial learning environment. To be exact, the overall mean score of 4.36 validates that the bot successfully reduces the cognitive load on students, as they do not have to rely solely on memory for complex wiring diagrams or multimeter settings.

Table 6: Mean scores of Section D

Items	Score Mean	SD	Level
The bot is well-suited as a platform for sharing instructional content.	4.35	.555	High
The implementation of the bot supports effective digital learning.	4.33	.583	High
The implementation of the bot promotes the integration of IR 4.0 technologies within the educational sector.	4.33	.583	High
The bot provides a self-learning platform for students.	4.37	.592	High
The bot is highly beneficial in supporting the learning process for the Vehicle Electrical System course.	4.43	.602	High

E. Students Performance

In addition to evaluating students' perceptions of the SAU10212 Telegram Bot, this study also reviewed overall student performance across two academic sessions to observe changes associated with the implementation of the bot. The comparison involved students from Session II 2024/2025, during which the bot was not used, and students from Session I 2025/2026, during which the bot was implemented as a learning support tool. Figure 4 presents the comparison of student performance between the two academic sessions. The findings show that the proportion of students obtaining marks below 90 was lower in Session I 2025/2026 compared with Session II 2024/2025. This pattern indicates a positive performance trend following the implementation of the SAU10212 Telegram Bot. Although the two groups consisted of students from different academic sessions, the comparison provides useful preliminary evidence regarding the potential educational value of the bot in supporting teaching and learning. The availability of structured learning materials, easier access to course content, and opportunities for self-paced revision may have contributed to better student readiness and overall performance. Therefore, the implementation of the bot appears to support a more flexible and effective learning process in the Vehicle Electrical Systems course.

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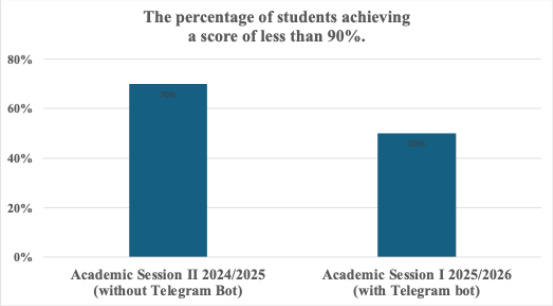

Figure 4: Comparison of two academic sessions.

The chart in Figure 4 illustrates an improvement trend in student performance following the implementation of the Telegram bot. By comparing the two academic sessions, two observations can be made. First, in Academic Session II 2024/2025, which represents the group without the bot, 70% of students scored below the 90% threshold. In contrast, in Academic Session I 2025/2026, representing the group that used the bot, this proportion decreased to 50%. Second, this reflects a 20 percentage-point reduction in the number of students scoring below 90 after the introduction of the bot. This descriptive difference suggests that more students achieved higher overall marks when the Telegram bot was used as a supplementary learning tool. However, because the comparison involved students from different academic sessions, the findings should be interpreted cautiously and not as conclusive proof of causality.

VI. CONCLUSION

In light of these findings, lecturers play a vital role in cultivating effective digital learning environments and possess creative teaching skills. The success of the bot implementation serves as a practical reflection of this theory. Accordingly, the positive reception of this bot suggests a successful alignment between the lecturer's digital strategy and student needs. By providing a platform that is user-friendly, technically stable, and IR 4.0 compliant, it has successfully moved from conventional teaching method to create a sustained learning ecosystem for the Vehicle Electrical System module. On the whole, this shift demonstrates the ability of such methods to positively influence student participation in advanced technical subjects. The digital transformation of 21st century education necessitates that lecturers adopt innovative platforms, which serve as critical instruments in facilitating contemporary teaching and learning methodologies.

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