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Learning Engagement with AI Tools and Academic Performance

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ABSTRACT: The growing integration of artificial intelligence tools in education has sparked an increasing interest in determining students' level of learning engagement with these tools across cognitive, emotional, and behavioral dimensions, assessing their academic performance, and examining the relationship and predictive value of engagement on academic performance. A correlational and causal research design was employed to explore associations and causality between variables. The respondents were junior high school students from selected private schools in Cagayan de Oro City. Stratified random sampling was used to ensure equitable representation among the three participating schools. A researcher-made questionnaire measured learning engagement, while academic performance was based on the average first and second quarter grades. Descriptive statistics, Mean, Standard Deviation, Pearson r, and Multiple Linear Regression were used to analyze the data. The mean score for behavioral, emotional, and cognitive was highly engaged. The respondents' level of academic performance was outstanding, and behavioral engagement showed a very strong positive correlation with the students' academic performance. It can be concluded that the students found enjoyment in using AI tools to help them improve their academic performance. Students may continue to use AI tools to improve their academic performance, but not to the extent of purely depending on them all the time. It is recommended that educators focus on strengthening students' cognitive engagement using well-designed AI tools. while also revising teaching methods to encourage greater cognitive involvement.

KEYWORDS: academic performance, AI tools, learning engagement

I. INTRODUCTION

Learning engagement refers to the level of involvement and motivation a learner shows in the learning process. It encompasses their interest, curiosity, attention, and passion for the lesson. In essence, it is about how deeply a learner connects with the learning experience and how actively they participate in it. This, therefore, involves actively interacting with the material, asking questions, and participating in discussions. As such, engaged learners can concentrate and maintain their attention on the task at hand. This would probably result in a better class performance.

Hence, classrooms today are gradually evolving as educators' experiment with new approaches, including the use of artificial intelligence (AI). Instead of relying solely on fixed teaching methods, some turn to digital systems that respond in real time to how each student interacts with the material. Whether it is a smart tutoring app or a learning tool that adapts as a student progress, the goal is to help learners advance at a pace that suits their own understanding and learning style. It is believed that learning engagement goes beyond simply staying focused during lessons; it reflects how students process information, act within the learning environment, and emotionally connect to their studies. An actively engaged student is more likely to understand concepts deeply, participate in discussions, and perform well academically. AI tools are designed to support this process by offering interactive lessons, real-time feedback, and personalized learning pathways (Ellikkal & Rajamohan, 2024).

With AI tools employed by teachers in the classroom, it is expected that the academic performance level of students, typically measured by their grades, test scores, and overall academic accomplishments, will be much better. The students' ability to master subject matter, apply knowledge, and engage in their studies will improve. Thus, become successful in their educational endeavors.

Huang's et al. (2023) pointed out the improvements in students' interests, efforts, and academic results when instruction is tailored more personally. Even so, the actual effect of these technologies on student learning and engagement still raises important questions and deserves closer examination. Moreover, previous research has explored AI's impact, showing that these tools contribute to better engagement and improved academic results. In addition, structured feedback mechanisms in AI-driven

learning environments have also activated cognitive and emotional engagement, especially in online learning settings (Saleem et al., 2025). Despite growing interest in artificial intelligence in education, most studies concentrate on its application in colleges and universities. This leaves limited insight into how such technologies affect younger learners, particularly those in junior high. Since this stage plays a key role in shaping study habits and core academic abilities, it becomes increasingly important to explore how AI tools influence student engagement and educational progress at this level. Hence, this study was conducted.

The worldwide and extensive application of Artificial Intelligence (AI) in education has enabled the development of personalized learning experiences driven by data. This study is based on three key theories—AI Theory, Self-Determination Theory, and Learning Engagement Theory, which collectively offer a framework for examining how AI tools influence student engagement and academic performance. These theories provide strong foundations in understanding the mechanisms behind AI-driven learning environments, student motivation, and the relationship between engagement and academic success. Artificial Intelligence Theory is the basis of this study, emphasizing its significant influence of AI-powered tools in education by delivering individualized instruction, prompt feedback, and customized learning assistance.

Students receive personalized learning material through AI-based applications that tailor the output based on the students' learning abilities, allowing them to progress at their own speed and get instant feedback on their progress. According to Ouyang and Jiao (2021), AI in education operates through three main paradigms: intelligent tutoring systems, learning analytics, and automated assessments, each contributing to improving students' engagement and learning outcomes. AI-supported tools are expected to successfully promote students' more active learning and their academic achievement.

Various elements impacted learning engagement, including the setting, social interactions, and the technology. It is closely linked to students' motivation, where Self-Determination Theory (SDT) becomes relevant. Self-Determination Theory (SDT), initially developed by Deci and Ryan and later applied in educational contexts, suggests that students are more inclined to participate in learning when their core psychological needs—autonomy, competence, and relatedness—are satisfied (Guay, 2021). AI solutions are valuable in supporting students by giving them their educational destiny. They provide positive, timely feedback that helps build students' confidence and helps shape environments that foster student collaboration and peer interaction. When students feel motivated and are in charge of their learning, they are more likely to fully invest in the topic and actively engage in the learning process. It is believed that AI tools can enhance students' motivation by satisfying these psychological needs, and whether this motivation translates into better engagement and academic outcomes.

In addition to motivation, Learning Engagement Theory offers valuable perspectives on how technology-enhanced learning experiences can influence students' academic achievements. Learning engagement is generally divided into three key dimensions: cognitive, behavioral, and emotional (Pan & He, 2024). AI tools support cognitive engagement by offering interactive and thought-provoking content, behavioral engagement through gamified activities and progress tracking, and emotional engagement by creating a more enjoyable and less intimidating learning environment. Research suggests that more engaged students tend to achieve higher academic performance, making engagement a crucial factor in learning. This study examined the extent to which AI tools enhance these different dimensions of engagement and whether engagement serves as a bridge between AI utilization and academic success.

By integrating these three theories, this study explored the interconnectedness of AI tools, student engagement, and academic performance. Artificial Intelligence Theory explains how AI tools function within learning environments, Self-Determination Theory provides insights into how AI tools can support student motivation, and Learning Engagement Theory highlights the role of engagement in improving academic outcomes. Understanding these relationships allowed educators and policymakers to make well-informed decisions about incorporating AI into the classroom so that these technologies can enhance, and not substitute, the human content of teaching and learning. The illustration on the next page illustrates the relationship between learning engagement in education and academic performance. It illustrates how students' engagement across behavioral, cognitive, and emotional dimensions can impact their academic performance. This research treats learning engagement as the independent variable, while academic performance, as indicated by students' average grades during the first and second quarters, is the dependent variable.

Behavioral engagement is how students participate in pedagogical activities such as attending classes, performing tasks, and participating in discussions. If students attend and complete work, they are more likely to establish effective study habits, which can improve educational outcomes. Cognitive engagement, meanwhile, relates to the depth at which they engage with the material. Students who think about a concept critically, contemplate it, think about it declaratively, and practice it have better retention and do better on exams. Lastly, emotional engagement pertains to how students feel about and connect emotionally with their learning experience. A positive emotional connection to their studies, such as feeling motivated, interested, or excited about learning, can increase perseverance, especially when faced with academic challenges.

This study aims to investigate how these dimensions of engagement influence students' academic success. Whether these more engaged students (behaviorally, cognitively, or emotionally) performed better academically than the less engaged is the subject of this study. If this connection can be understood, educators may be able to design interventions to increase engagement, perhaps employing AI tools to foster an interactive and more student-focused learning.

II. METHODOLOGY

This study employed a descriptive correlational and causal research design to investigate the relationship between AI-assisted learning engagement and the academic performance of junior high school students. The descriptive component captured the students' level of engagement with AI tools, while the correlational aspect measured the connection between their behavioral, cognitive, and emotional engagement and academic performance. Correlational design was used to examine the relationships between or among two or more variables in a single group, which can occur at several levels (Devi et.al, 2023). Causal research design was employed to investigate cause-and-effect relationships between variables (Ghanad, 2023). The causal part examined whether AI-supported engagement had a direct influence on students' first and second-quarter grades.

The statistical tools utilized in this study are the following:

Problems 1 and 2 used the Mean and Standard Deviation to determine the extent of the respondents' learning engagement and academic performance. Problem 3 employed Pearson's Product-Moment Correlation Coefficient to test for a significant relationship between respondents' learning engagement and academic performance at 0.05 level of significance. Problem 4 used the Multiple Linear Regression Analysis to determine which among the independent variables singly or in combination influences the dependent variable.

III. RESULTS AND DISCUSSION

Problem 1. What is the respondents' level of learning engagement in terms of:

1.1. behavioral;
1.2. emotional; and
1.3 cognitive?

Table 1: Overall Learning Engagement with AI Tools

Variables	Mean	SD	Description	Interpretation
Behavioral	3.41	1.10	Agree	Highly Engaged
Emotional	3.51	1.09	Agree	Highly Engaged
Cognitive	3.55	1.03	Agree	Highly Engaged
Overall	**3.49**	**1.07**	**Agree**	**Highly Engaged**

Note: 4.21-5.00 - Very High 3.41-4.20 - High 2.61-3.40 - Average 1.81-2.60 - Low 1.00-1.80 - Very Low

Table 1 presents the Overall Engagement with AI Tools. It has an overall mean of 3.49 and SD = 1.07, described as Agree and interpreted as Highly Engaged. This result indicates that students generally agreed they were behaviorally, emotionally, and cognitively engaged when using AI tools, across all subdomains. The researcher observed that these high engagement levels may be due to the interactive and responsive features of AI tools, which often include real-time feedback and tailored learning experiences. These results suggest that students found AI tools not only useful but also motivating, helping them participate more actively in class tasks. The consistent scores across the three dimensions reflect a balanced perception of engagement, implying that AI tools support the holistic development of learning behaviors. The use of AI seems to help students remain attentive, emotionally connected, and mentally involved in their academic activities.

This finding was supported by Li and Xue (2023), who emphasized the reciprocal nature of student engagement and learning environments, particularly when supported by technology. Similarly, Nguyen et al. (2024) highlighted how adaptive learning platforms and AI-driven systems improve student involvement by customizing instruction and providing immediate feedback. According to Rajabalee et al. (2019), meaningful engagement in digital learning environments is crucial for academic success, underlining the role of participatory digital tools. Zawacki-Richter et al. (2019) also noted that AI-powered educational systems enhance behavioral engagement by offering personalized learning pathways. Lastly, Mamun and Lawrie (2023) affirmed that AI-supported inquiry learning helps students stay engaged with content by promoting autonomy and curiosity.

In the table, cognitive engagement received the highest Mean score of 3.55 and SD = 1.03, described as Agree and interpreted as Highly Engaged. This result suggested that among the three variables—behavioral, emotional, and cognitive engagements, students demonstrated the strongest involvement in cognitive aspects when using AI tools in their learning.

The researcher believed that this strong cognitive engagement indicated that students were actively processing information, utilizing metacognitive strategies, and persisting in academic tasks while interacting with AI platforms. This high level of engagement might have stemmed from the AI tools' ability to personalize content, challenge students intellectually, and stimulate critical thinking. It also implied that learners were more mentally invested and motivated to understand complex materials through the support of adaptive technology. The finding showed that AI integration encouraged deep learning approaches rather than surface-level memorization, which contributed to meaningful academic experiences.

This result was supported by Shi et al. (2021), who emphasized that cognitive engagement involved focused attention, metacognitive strategy use, and sustained academic effort. Similarly, Venn et al. (2020) found that AI tools significantly shaped students' ability to engage cognitively, especially by enhancing critical thinking through interactive digital content. Chaudhary et al. (2024) confirmed that AI-enhanced learning platforms helped students process complex information and supported real-time academic forecasting based on cognitive needs. Adams (2025) also stated that AI fostered curiosity and learning ownership, essential for higher-order thinking development. Moreover, DiCerbo (2024) argued that AI promoted inquiry-based learning, wherein students actively constructed knowledge, further reinforcing the strong cognitive engagement observed in the study.

In the same table, the behavioral engagement received the lowest Mean score of 3.41 and SD = 1.10, described as Agree and interpreted as Highly Engaged. This result indicated that although students were still highly engaged behaviorally, this dimension of engagement scored lower compared to emotional and cognitive engagements. The researcher interpreted this as a possible reflection of students' varying levels of physical or observable participation in AI-assisted learning activities, such as completing tasks on time, attending sessions, and interacting actively. It might have also indicated that while students were mentally and emotionally motivated, their outward actions, such as punctuality, participation, and consistency, could have been less influenced by AI tools. AI platforms may have enhanced thinking and feeling processes more than action-oriented behaviors. The finding suggested that although AI contributed to behavioral engagement, it may not have fully replaced the value of teacher-driven structure or peer accountability in maintaining consistent learning behaviors.

This aligned with Zawacki-Richter et al. (2019), who found that AI tools supported students' behavioral engagement through adaptive learning and intelligent tutoring, but noted that the extent of behavioral change could vary. Similarly, the Gates Foundation (2023) emphasized that AI tools functioned as learning assistants, promoting time management and task completion. Yang and Ogata (2022) revealed that personalized learning analytics improved students' behavioral involvement by providing real-time feedback based on performance. However, Fahmy (2023) warned that while AI could boost task efficiency, it might reduce students' willingness to attend traditional classes. Consoli et al. (2024) further asserted that the effectiveness of AI in promoting behavioral engagement depended on the quality of its integration into the learning environment.

Problem 2. What is the respondents' level of academic performance?

Table 2: Academic Performance

Grade	Frequency	Percentage	Mean	Standard Deviation	Interpretation
90-100	105	52.76	90.63	2.98	Outstanding
85-89	88	44.22			
80-84	6	3.02			
Total	**199**	**100.00**			

Note: .90-100 – Outstanding 85-90 - Very Satisfactory 80-84 - Satisfactory 75-79 - Fairly Satisfactory below 75 - Did not Meet Expectations

Table 2 presents the Academic Performance. It has an overall Mean of 90.63 and SD = 2.98, interpreted as Outstanding. This suggests that the majority of students performed at a high academic level, indicating strong achievement outcomes. The results show that 52.76% of students scored between 90–100, 44.22% scored between 85–89, and only 3.02% scored between 80–84, reinforcing the overall outstanding interpretation. This outstanding performance suggests that learners not only met but also exceeded academic expectations, potentially due to factors such as motivation, effective technological integration, and supportive learning environments. The researcher believed that this level of performance may reflect the positive impact of innovative strategies like AI tools and hybrid learning models. Such an environment likely cultivated higher engagement, allowing students to demonstrate mastery in their academic tasks. Furthermore, the minimal percentage of lower scores indicates a narrow performance gap, which may highlight the effectiveness of interventions or instruction that meet varied student needs.

Learning Engagement with AI Tools and Academic Performance

According to Ellikkal and Rajamohan (2024), AI-powered tools use adaptive learning technologies to provide instruction tailored to each learner's needs, thereby enhancing academic success. Mirdad et al. (2024) also emphasized that personalized feedback through AI systems increased engagement and contributed to deeper learning outcomes. Yakhina et al. (2024) discovered that real-time AI support in problem-solving enhanced academic achievement among engineering students. Das et al. (2023) confirmed that personalized AI strategies improved performance by aligning with individual learning styles. Moreover, Almusaed et al. (2023) noted that in hybrid learning environments, AI-driven tools significantly enhanced both motivation and academic achievement.

The highest-grade range, frequency, and percentage in the table showed that the 90–100 range had the highest number of students, with a frequency of 105 and a percentage of 52.76%. This means that more than half of the respondents achieved an Outstanding level of academic performance. The researcher interpreted this as a strong indication of academic excellence among the majority of students. This high achievement level might have resulted from the use of effective instructional methods, including AI-powered learning tools that provided adaptive and personalized experiences. The findings suggested that students were well-supported both technologically and pedagogically, contributing to their academic success. Moreover, this result may reflect students' high levels of motivation and self-regulation, enhanced by accessible and engaging digital learning environments.

In support of these insights, Ellikkal and Rajamohan (2024) stated that AI tools equipped with adaptive learning features allowed for customized instruction, leading to improved academic results. Mirdad et al. (2024) found that AI-based platforms increased engagement through personalized feedback, which contributed to deeper learning. Yakhina et al. (2024) highlighted the role of real-time support from AI systems in helping students succeed academically, particularly in problem-solving tasks. Similarly, Das et al. (2023) emphasized the positive impact of aligning AI tools with individual learning styles, which fostered academic improvement. Almusaed et al. (2023) concluded that AI integration in hybrid learning environments boosted both motivation and performance, highlighting its role in achieving outstanding academic outcomes.

Conversely, the lowest grade range, frequency, and percentage in the table showed that the 80–84 range had the fewest number of students, with a frequency of 6 and a percentage of 3.02%. This result indicated that only a small portion of students performed at the Satisfactory level. The researcher believed that this minimal percentage might reflect the effectiveness of academic strategies and technological interventions implemented in the learning environment. It was possible that the integration of AI tools, adaptive feedback systems, and supportive teaching practices contributed to a general uplift in student performance, leaving fewer learners in the lower academic tiers. This finding might also signify that the learning context had reduced barriers to performance, allowing the majority of students to attain higher levels of achievement. The relatively low frequency in this grade range could have been an indication of the success of personalized learning approaches and active engagement practices.

Supporting this interpretation, Das et al. (2023) found that AI-driven, personalized learning pathways significantly improved academic outcomes by catering to individual learning preferences. Ellikkal and Rajamohan (2024) highlighted that AI-powered adaptive learning tools helped address student weaknesses through targeted instruction. According to Mirdad et al. (2024), students benefitted from interactive AI feedback, which enhanced their learning depth and engagement. Yakhina et al. (2024) also reported that real-time AI support enabled more efficient problem-solving and learning progression. Finally, Almusaed et al. (2023) emphasized that AI integration in hybrid learning not only boosted motivation but also reduced performance gaps among students.

Problem 3. Is there a significant relationship between the respondent's level of learning engagement and academic performance?

Table 3 presents the Correlation Analysis. The results showed that behavioral engagement ($r = 0.835$, $p = 0.000$) and emotional engagement ($r = 0.650$, $p = 0.000$) have a significant positive correlation with academic performance, while cognitive engagement ($r = 0.004$, $p = 0.952$) does have any correlation.

Table 3: Correlation Analysis

Independent Variables	r-value	p-value	Description	Decision on Ho	Interpretation
Behavioral	0.835**	0.000	Very Strong Positive	Reject	Significant
Emotional	0.650**	0.000	Strong Positive	Reject	Significant
Cognitive	0.004	0.952	No Correlation	Accept	Not Significant

**. Correlation is significant at the 0.01 level (2-tailed).

These findings imply that students' behavioral and emotional involvement are crucial contributors to their academic outcomes. The behavioral engagement's very strong correlation suggests that consistent class participation, assignment

completion, and proactive learning behaviors were highly influential in academic success. Emotional engagement also played a significant role, indicating that students' interest and emotional investment in learning affected their performance. Conversely, the lack of correlation in cognitive engagement may reflect an over-reliance on AI tools, which possibly hindered students from deeply processing learning content independently. The researcher interpreted this as a sign that while technology may assist learning, it should not replace active cognitive involvement.

These findings aligned with Zawacki-Richter et al. (2019), which emphasized that AI-powered tools increase students' behavioral engagement by offering adaptive learning and personalized support. Yang and Ogata (2022) also noted that behavioral engagement improved when students received real-time feedback, leading to better study habits and participation. In the emotional domain, Khan et al. (2023) found that positive emotions such as enjoyment and interest contributed significantly to academic outcomes. Guay (2021) further explained that meeting students' autonomy and relatedness needs enhanced emotional engagement, thereby fostering intrinsic motivation. Thomas and Allen (2020) confirmed that emotional intelligence supports students' resilience and motivation in academic settings. Pan and He (2024) indicated that emotional connection to learning activities strongly influenced students' acceptance of innovative classroom models. Santos et al. (2023) reinforced those students with strong emotional and social competencies were more likely to be engaged academically. Ouyang and Jiao (2021) highlighted that AI tools should support rather than replace emotional connections in learning, further emphasizing that emotionally engaged students perform better when these relationships are maintained.

The results showed that behavioral engagement had the highest correlation with academic performance, with an r-value of 0.835 and a p-value of 0.000, indicating a very strong positive relationship. The description of the correlation was *Very Strong Positive*, leading to the rejection of the null hypothesis and the interpretation that the relationship was statistically significant. The researcher viewed this result as highly indicative of the importance of active student participation in academic tasks. Behavioral engagement, such as timely submission of assignments, participation in discussions, and class attendance, significantly influenced learning outcomes. This strong correlation suggested that external manifestations of engagement were closely tied to students' academic success. It also implied that observable learning behaviors may serve as reliable predictors of performance in AI-supported environments. From the researcher's perspective, fostering behavioral engagement should be prioritized in both curriculum planning and the implementation of AI tools.

This finding is aligned with Zawacki-Richter et al. (2019), who found that AI-powered learning platforms enhanced behavioral engagement through personalized feedback and adaptive learning paths. Yang and Ogata (2022) confirmed that AI-based learning analytics supported students by offering custom guidance, resulting in better class participation. Mamun and Lawrie (2023) also emphasized that AI tools allowed students to explore subjects at their own pace, thereby maintaining consistent engagement. The Gates Foundation (2023) indicated that AI-assisted tools could function as academic aides, promoting task completion and deadline adherence. Furthermore, the literature reviewed by Consoli et al. (2024) revealed that successful integration of AI technology supported students' behavioral responses, while poorly designed systems risked disengagement. Research by Fahmy (2023) suggested that although AI boosted task efficiency, it required careful design to sustain physical attendance. These perspectives collectively demonstrated that behavioral engagement, when supported by effective AI integration, significantly contributed to improved academic performance.

The results showed that cognitive engagement had the lowest correlation with academic performance, with an r-value of 0.004 and a p-value of 0.952, indicating no correlation. The description was "No Correlation," leading to the acceptance of the null hypothesis and the interpretation that the relationship was not statistically significant. The researcher interpreted this finding as unexpected, given that cognitive engagement is generally associated with deeper learning and academic achievement. The result may have suggested that while students used AI tools, they might have engaged more behaviorally or emotionally rather than cognitively. It could also imply that students were relying on surface-level interaction with AI platforms rather than using them for critical thinking or deep learning. From the researcher's perspective, this highlighted a potential gap in how AI tools are designed or used to support independent and analytical thinking. This low correlation emphasized the need to reassess instructional strategies that promote cognitive depth in AI-enhanced learning environments.

This outcome echoed concerns raised by Chaudhary et al. (2024), who warned that students could become overly reliant on AI tools, thereby limiting their ability to develop independent problem-solving skills. Shi et al. (2021) also found that while AI-supported platforms encouraged student motivation, their effect on long-term cognitive engagement remained uncertain. DiCerbo (2024) discussed that although AI could foster inquiry-based learning, its impact depended heavily on the design and integration of the tools. Adams (2025) noted that some educational institutions were intentionally designing adaptive frameworks to promote cognitive engagement, but these efforts had not yet guaranteed uniform results. Similarly, Chaudhary et al. (2024) as well as Pamon and Oco (2024) observed that without personalized support strategies, cognitive development might be hindered despite technological advancements. Venn et al. (2020) suggested that digital learning tools could foster higher-order thinking,

but only when paired with strong pedagogical models. Ouyang and Jiao (2021) found that students' emotional and behavioral responses were often prioritized in AI integration, sometimes at the expense of cognitive outcomes. These studies collectively indicated that while technology holds potential, the lack of significant correlation in this result underlined the importance of deliberate cognitive engagement strategies in AI-enhanced learning.

Problem 4. Which of the independent variables singly or in combination significantly predict the dependent variables of the study?

Table 4: Multiple Linear Regression

Independent Variables	Unstandardized Coefficients		Standard Coefficient Beta		
	B	Std. Error		T	Sig.
(Constant)	90.691	1.276		71.051	0.000
Behavioral	0.133	0.568	0.024	0.214	0.827
Emotional,	-0.104	0.594	-0.028	-0.175	0.861
Cognitive	-0.020	0.492	-0.004	-0.041	0.968
		R=0.017	R^2=0.000	F=0.018	Sig=0.000

a. Dependent Academic Performance

b. Predictors (Constant): Behavioral, Emotional, Cognitive

Table 4 presents the Multiple Linear Regression Analysis. The results revealed that the unstandardized coefficients (B) for Behavioral, Emotional, and Cognitive engagement were 0.133, -0.104, and -0.020, respectively, with all corresponding p-values above 0.05—Behavioral (Sig. = 0.827), Emotional (Sig. = 0.861), and Cognitive (Sig. = 0.968)—indicating no statistically significant relationship with academic performance. The standard errors were relatively high (Behavioral = 0.568, Emotional = 0.594, Cognitive = 0.492), and T-values were all below 1, further confirming the insignificance. The Standardized Beta Coefficients were also very low: Behavioral (0.024), Emotional (-0.028), and Cognitive (-0.004), reflecting minimal effect sizes in predicting the dependent variable. The researcher interpreted these findings as indicative of weak predictive value among the three engagement dimensions when analyzed independently, perhaps due to overlapping variances or uncontrolled external factors. The lack of statistical significance might suggest that other variables, such as instructional design, AI tool effectiveness, or emotional climate, could moderate or mediate the impact of engagement. Moreover, the researcher reflected that the negligible coefficients and insignificant T-values underscore the possibility of misalignment between students' perceived engagement and actual academic achievement outcomes. The findings prompted the researcher to question whether a linear model was appropriate for capturing the complexity of engagement or whether more nuanced, qualitative methods should supplement these results.

Rajabalee et al. (2019) demonstrated a strong correlation between student engagement in digital environments and academic success, emphasizing the need for interactive and participatory learning tools. Li and Xue (2023) explained that a dynamic learning environment fosters reciprocal engagement, which may not have been fully reflected in this model. Thomas and Allen (2020) found that emotional intelligence played a key role in sustaining engagement, particularly in high-pressure academic settings. Irshad et al. (2023) showed that institutional support and a positive academic climate significantly influenced engagement, suggesting that environmental context could be a missing factor. Additionally, Nguyen et al. (2024) emphasized that AI-enabled learning environments must be well-integrated to meaningfully enhance engagement and, consequently, performance—highlighting a potential area for future exploration in relation to the current study's findings.

The results showed that among the independent variables, Behavioral engagement had the highest unstandardized coefficient (B = 0.133), with a standard error of 0.568, a T-value of 0.214, and a significance level (Sig.) of 0.827, indicating no statistically significant influence on academic performance. The standard coefficient beta for Behavioral was 0.024, suggesting a minimal positive relationship. Although not statistically significant, the Behavioral variable stood out compared to Emotional and Cognitive engagement, whose coefficients were lower and negative. The researcher reflected that this may suggest a slight tendency for behavioral engagement, such as attendance, task completion, and participation, to be associated with better academic performance, even if the impact was not meaningful in this sample. The low significance level and high standard error may have resulted from sample limitations or variability in how behavioral engagement was expressed across different learning environments. The researcher also believed that despite its lack of significance, Behavioral engagement's positive coefficient could hint at a latent impact that requires further investigation with a larger or more diverse dataset. Zawacki-Richter et al. (2019) reported that AI-enhanced educational tools encouraged students to engage more actively with coursework, thereby improving

behavioral engagement. Yang and Ogata (2022) highlighted the importance of personalized learning analytics in increasing behavioral involvement through timely, adaptive feedback.

The Gates Foundation (2023) suggested that AI-supported platforms helped students manage workloads and deadlines, improving consistency in behavioral participation. Li and Xue (2023) also found that a positive and interactive learning environment fostered behavioral engagement through mutual responsiveness. Finally, Mamun and Lawrie (2023) illustrated that AI-based self-regulated learning modules supported students' ability to stay on task and engaged, particularly in complex subjects, which aligned with the minor positive trend observed in the current study.

The results indicated that Cognitive engagement had the lowest unstandardized coefficient (B = -0.020), with a standard error of 0.492, a T-value of -0.041, and a significance level (Sig.) of 0.968, making it the least predictive variable of academic performance in the model. The standard coefficient beta was -0.004, indicating a negligible and negative relationship. This implied that cognitive engagement, as measured in the study, had virtually no contribution to predicting students' academic performance. The researcher interpreted these findings as surprising, given that cognitive engagement often relates to deep learning strategies and problem-solving skills. It was suggested that students may have displayed cognitive effort that was not accurately captured or aligned with academic performance metrics. Furthermore, the researcher considered whether reliance on AI-assisted learning might have unintentionally reduced students' need to apply cognitive effort independently, which could explain the flat result in the regression.

Shi et al. (2021) emphasized that cognitive engagement encompasses mental effort and self-regulated learning, both of which significantly influence learning retention. Venn et al. (2020) reported that digital and AI tools promoted deeper engagement with academic material, strengthening higher-order thinking. Chaudhary et al. (2024) noted that real-time analytics in adaptive systems aimed to support students' cognitive development by forecasting performance. Adams (2025) also pointed out that English schools applied AI to design adaptive learning experiences, aiming to cultivate curiosity and ownership of learning. DiCerbo (2024) further argued that AI-based inquiry learning could reshape student engagement, requiring learners to construct rather than merely consume knowledge, highlighting a mismatch between the theoretical potential of AI in cognitive engagement and the current study's empirical findings.

IV. CONCLUSIONS

From the findings of the study, the following conclusions are formulated:

1. Students must have appreciated using AI tools to help them achieve an outstanding academic performance.
2. The students' exceptional academic performance was primarily influenced by their use of AI tools.
3. The study concluded that while emotional and behavioral engagement significantly influenced academic performance, cognitive engagement showed no meaningful impact, highlighting the need for educators to integrate engagement strategies with broader academic and socio-emotional supports to enhance student achievement.
4. The study concluded that Behavioral, Emotional, and Cognitive engagement were not significant predictors of academic performance, indicating that other factors like environmental context and instructional methods may have played a more crucial role in the results.

V. RECOMMENDATIONS

In light of the findings and conclusions, the following recommendations are proposed:

1. The students may continue to use AI tools to improve their academic performance, but not to the extent of purely depending on them all the time.
2. Continue and expand the use of AI-powered adaptive learning tools and hybrid learning models to maintain and further improve student academic performance, as these strategies effectively increased motivation, engagement, personalized support, and minimized performance gaps.
3. The study recommended that educators may focus on strengthening students' cognitive engagement using well-designed AI tools. while also revising teaching methods to encourage greater cognitive involvement.
4. It is also recommended that future research should explore additional moderating variables to capture the complex and potentially nonlinear relationships between student engagement dimensions and academic performance.

REFERENCES

1) Adams, R. (2025). The English schools looking to dispel 'doom and gloom' around AI. The Guardian.https://www.theguardian.com/education/2025/mar/06/the-english-schools-looking-to-dispel-doom-and-gloom-around-ai

2) Almusaed, A., Almssad, A., Yitmen, I., & Homod, R. Z. (2023). Enhancing Student Engagement: Harnessing "AIED"'s Power in Hybrid Education—A Review analysis. Education Sciences, 13(7), 632. https://doi.org/10.3390/educsci13070632
3) Alshater, M. M. (2022). Exploring the Role of Artificial Intelligence in Enhancing Academic Performance: A Case Study of ChatGPT. Papers.ssrn.com. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4312358
4) Chaudhary, A. A., Arif, S., Calimlim, R. J. F., Khan, S. Z., & Sadia, A. (2024). The impact of AI-powered educational tools on student engagement and learning outcomes at higher education level. International Journal of Contemporary Issues in Social Sciences, 3(2), 2842–2852. https://ijciss.org/index.php/ijciss/article/view/1027
5) Consoli, T. et. al (2024). Quality of technology integration matters: Positive associations with students' behavioral engagement and digital competencies for learning. Education and Information Technologies. https://doi.org/10.1007/s10639-024-13118-8
6) Das, A., Sanjeev Malaviya, & Singh, M. (2023). The Impact of AI-Driven Personalization on Learners' Performance. International Journal of Computer Sciences and Engineering, 11(08), 15–2 https://doi.org/10.26438/ijcse/v11i8.1522
7) DiCerbo, K. (2024). Kristen DiCerbo. Time. https://time.com/7012801/kristen-dicerbo/
8) Eltahir, M. E., & Babiker, F. M. E. (2024). The influence of artificial intelligence tools on student performance in e-learning environments: Case study. Electronic Journal of e-Learning, 22(9). https://academic-publishing.org/index.php/ejel/article/view/3639
9) Fahmy, M. (2023). Student perception on AI-driven assessment: Motivation, attendance, and emotions. University of Twente Student Theses. https://essay.utwente.nl/100985/1/Fahmy_BA_EEMCS.pdf
10) Fan, J., Fang, L., Wu, J., Guo, Y., & Dai, Q. (2020). From Brain Science to Artificial Intelligence. Engineering, 6(3), 248–252. https://doi.org/10.1016/j.eng.2019.11.012
11) Fazil, A. W., Hakimi, M., Shahidzay, A. K., & Hasas, A. (2024). Exploring the broad impact of AI technologies on student engagement and academic performance in university settings in Afghanistan. RIGGS Journal of Artificial Intelligence and Digital Business, 2(2), 56–63. https://doi.org/10.31004/riggs.v2i2.26.
12) Fitria, T. N. (2021). Artificial Intelligence (Ai) In Education: Using Ai Tools For Teaching And Learning Process. https://prosiding.stie-aas.ac.id/index.php/prosenas/article/view/106
13) Ghanbaripour, A. N., et. al. (2024). A Systematic review of the impact of emerging technologies on student learning, engagement, and employability in built environment education. Buildings, 14(9), 2769. https://doi.org/10.3390/buildings14092769
14) Gates Foundation. (2023). Can AI transform education? Gates Foundation. https://gatesfoundation.org/ideas/articles/ai-tools-education-technology
15) Guay, F. (2021). Applying self-determination theory to education: Regulations types, psychological needs, and autonomy-supporting behaviors. Canadian Journal of School Psychology, 37(1), 75–92. https://doi.org/10.1177/08295735211055355
16) Huang, A. Y. Q., Lu, O. H. T., & Yang, S. J. H. (2023). Effects of artificial Intelligence–Enabled personalized recommendations on learners' learning engagement, motivation, and outcomes in a flipped classroom. Computers & Education, 194(104684), 104684. https://doi.org/10.1016/j.compedu.2022.104684
17) Irshad, M., Qureshi, M. A., Saraih, U. N., & Ahmad, S. F. (2023). Impact of institutional climate on the student's engagement and learning outcomes in private sector universities of Karachi. International Journal of Management in Education, 17(3), 297. https://doi.org/10.1504/ijmie.2023.130674
18) Jaboob, M., Manar Hazaimeh, & Al-Ansi, A. M. (2024). Integration of Generative AI Techniques and Applications in Student Behavior and Cognitive Achievement in Arab Higher Education. International Journal of Human-Computer Interaction, 1–14. https://doi.org/10.1080/10447318.2023.2300016
19) Jiang, Y., & Peng, J.-E. (2023). Exploring the relationships between learners' engagement, autonomy, and academic performance in an English language MOOC. Computer Assisted Language Learning, 1–26. https://doi.org/10.1080/09588221.2022.2164777
20) Khan, H., Gul, R., & Zeb, M. (2023). The Effect of Students' Cognitive and Emotional Engagement on Students' Academic Success and Academic Productivity. Winter 2023, 3(1), 322–334. https://doi.org/10.54183/jssr.v3i1.141
21) Lo, C. K., Hew, K. F., & Jong, M. S. (2024). The influence of ChatGPT on student engagement: A systematic review and future research agenda. Computers & Education, 219, 105100. https://doi.org/10.1016/j.compedu.2024.105100
22) Li, J., & Xue, E. (2023). Dynamic Interaction between Student Learning Behaviour and Learning Environment: Meta-Analysis of Student Engagement and Its Influencing Factors. Behavioral Sciences, 13(1), 59. https://doi.org/10.3390/bs13010059

23) Mamun, M. a. A., & Lawrie, G. (2023). Student-content interactions: Exploring behavioural engagement with self-regulated inquiry-based online learning modules. Smart Learning Environments, 10(1). https://doi.org/10.1186/s40561-022-00221-x
24) Mirdad, K., Daeli, O. P. M., Septiani, N., Ekawati, A., & Rusilowati, U. (2024, February 27). Optimizing student engagement and performance using AI-Enabled educational tools. https://journal.corisinta.org/corisinta/article/view/22
25) Mohammed Abdullatif Almulla. (2024). Investigating Influencing Factors of Learning Satisfaction in AI ChatGPT for Research: University Students Perspective. Heliyon, 10(11), e32220–e32220. https://doi.org/10.1016/j.heliyon.2024.e32220
26) Mohamed Mohamed Bayoumy, H., & Alsayed, S. (2021). Investigating Relationship of Perceived Learning Engagement, Motivation, and Academic Performance Among Nursing Students: A Multisite Study. Advances in Medical Education and Practice, Volume 12, 351–369. https://doi.org/10.2147/amep.s272745
27) Ng, K., Wu, W., Lok, K., Thomas, & Chu, S. (2023). Design and validation of the AI literacy questionnaire: The affective, behavioural, cognitive and ethical approach. British Journal of Educational Technology, 55(3). https://doi.org/10.1111/bjet.13411
28) Nguyen, A., Kremantzis, M., Essien, A., Petrounias, I., & Hosseini, S. (2024). Editorial: Enhancing Student Engagement Through Artificial Intelligence (AI): Understanding the basics, opportunities, and challenges. Journal of University Teaching and Learning Practice, 21(06). https://doi.org/10.53761/caraaq92
29) Obidovna, D. Z. (2024). The Pedagogical-Psychological Aspects Of Artificial Intelligence Technologies in Integrative Education. International Journal of Literature and Languages, 4(3), 13–19. https://doi.org/10.37547/ijll/volume04issue03-03
30) Ouyang, F., & Jiao, P. (2021). Artificial intelligence in education: The three paradigms. Computers and Education: Artificial Intelligence, 2(1), 100020. https://doi.org/10.1016/j.caeai.2021.100020
31) Owan, V. J., Abang, K. B., Idika, D. O., Etta, E. O., & Bassey, B. A. (2023). Exploring the potential of artificial intelligence tools in educational measurement and assessment. Eurasia Journal of Mathematics Science and Technology Education, 19(8), em2307.https://doi.org/10.29333/ejmste/13428
32) Pamon, E. Q., & Oco, R. M. (2024). Teachers' Competence and Learners' Academic Performance. *International Journal of Multidisciplinary Research and Analysis*, *7*(3), 1375–1283. DOI: 10.47191/ijmra/v7-i03-63
33) Pan, Y., & He, W. (2024). Research on the influencing factors of promoting flipped classroom teaching based on the integrated UTAUT model and learning engagement theory. Scientific Reports, 14(1), 15201. https://doi.org/10.1038/s41598-024-66214-7
34) Rajabalee, B. Y., Santally, M. I., & Rennie, F. (2019). A study of the relationship between students' engagement and their academic performances in an eLearning environment. E-Learning and Digital Media, 17(1), 1–20. https://doi.org/10.1177/2042753019882567
35) Rodríguez-Muñoz, A., Antino, M., Ruiz-Zorrilla, P., & Ortega, E. (2021). Positive emotions, engagement, and objective academic performance: A weekly diary study. Learning and Individual Differences, 92, 102087. https://doi.org/10.1016/j.lindif.2021.102087
36) Ruiz-Rojas, L. I., et. al (2023). Empowering Education with Generative Artificial Intelligence Tools: Approach with an Instructional Design Matrix. Sustainability, 15(15), 11524. https://doi.org/10.3390/su151511524
37) Santos, A. C., et. al. (2023). A systematic review of the association between social and emotional competencies and student engagement in youth. Educational Research Review, 39, 100535. https://doi.org/10.1016/j.edurev.2023.100535
38) Shi, Y., Tong, M., & Long, T. (2021). Investigating relationships among blended synchronous learning environments, students' motivation, and cognitive engagement: A mixed methods study. Computers & Education, 168, 104193. https://doi.org/10.1016/j.compedu.2021.104193
39) Singh, E., Prihana Vasishta, & Singla, A. (2024). AI-enhanced education: exploring the impact of AI literacy on generation Z's academic performance in Northern India. Quality Assurance in Education. https://doi.org/10.1108/qae-02-2024-0037
40) Stöhr, C., Amy Wanyu Ou, & Malmström, H. (2024). Perceptions and usage of AI chatbots among students in higher education across genders, academic levels and fields of study. Computers and Education. Artificial Intelligence, 7, 100259–100259. https://doi.org/10.1016/j.caeai.2024.100259
41) Sun, L., & Zhou, L. (2024). Does Generative Artificial Intelligence Improve the Academic Achievement of College Students? A Meta-Analysis. Journal of Educational Computing Research, 62(7). https://doi.org/10.1177/07356331241277937

42) Syeda, D., Batool, S., Shahab, I., Jalil, R., Arshad, A., Zahra, S. Q., Karim, S., Jamil, N., & Khan, N. (2025). Role of AI dependency in psychological distress and academic performance among university students. International Journal of Social Sciences Bulletin, 3(3), 286–294. https://theijssb.com/index.php/IJSSB/article/view/495
43) Tang, K. H. D. (2024). Implications of Artificial Intelligence for Teaching and Learning. Acta Pedagogia Asiana, 3(2), 65–79. https://doi.org/10.53623/apga.v3i2.404
44) The extent of AI applications in EFL learning and teaching. (2024). IEEE Journals & Magazine | IEEE Xplore. https://ieeexplore.ieee.org/abstract/document/10272618
45) Thomas, C. L., & Allen, K. (2020). Driving engagement: investigating the influence of emotional intelligence and academic buoyancy on student engagement. Journal of Further and Higher Education, 45(1), 107–119. https://doi.org/10.1080/0309877x.2020.1741520
46) Venn, E., Park, J., Andersen, L. P., & Hejmadi, M. (2020). How do learning technologies impact on undergraduates' emotional and cognitive engagement with their learning? Teaching in Higher Education, 28(4), 822–839. https://doi.org/10.1080/13562517.2020.1863349
47) Ventura, A., & Lopez, L. (2024). Unlocking the Future of Learning: Assessing Students' Awareness and Usage of AI Tools. https://doi.org/10.18178/ijiet.2024.14.8.2142
48) Wong, Z. Y., & Liem, G. a. D. (2021). Student engagement: current state of the construct, conceptual refinement, and future research directions. Educational Psychology Review, 34(1), 107–138.https://doi.org/10.1007/s10648-021-09628-3
49) Yakhina, R., Grigorieva, K., Batrova, N., & Lukoyanova, M. (2024). Ai-powered tools for enhancing engagement and academic performance of engineering students. Inted Proceedings, 1, 2990–2996. https://doi.org/10.21125/inted.2024.0809
50) Yang, C. C. Y., & Ogata, H. (2022). Personalized learning analytics intervention approach for enhancing student learning achievement and behavioral engagement in blended learning. Education and Information Technologies, 28(3), 2509–2528. https://doi.org/10.1007/s10639-022-11291-2
51) Yuan, L., & Liu, X. (2024). The Effect of Artificial Intelligence Tools on EFL Learners' Engagement, Enjoyment, and Motivation. Computers in Human Behavior, 108474–108474. https://doi.org/10.1016/j.chb.2024.108474
52) Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education. International Journal of Educational Technology in Higher Education, 16(1), 39. https://doi.org/10.1186/s41239-019-0171-0

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